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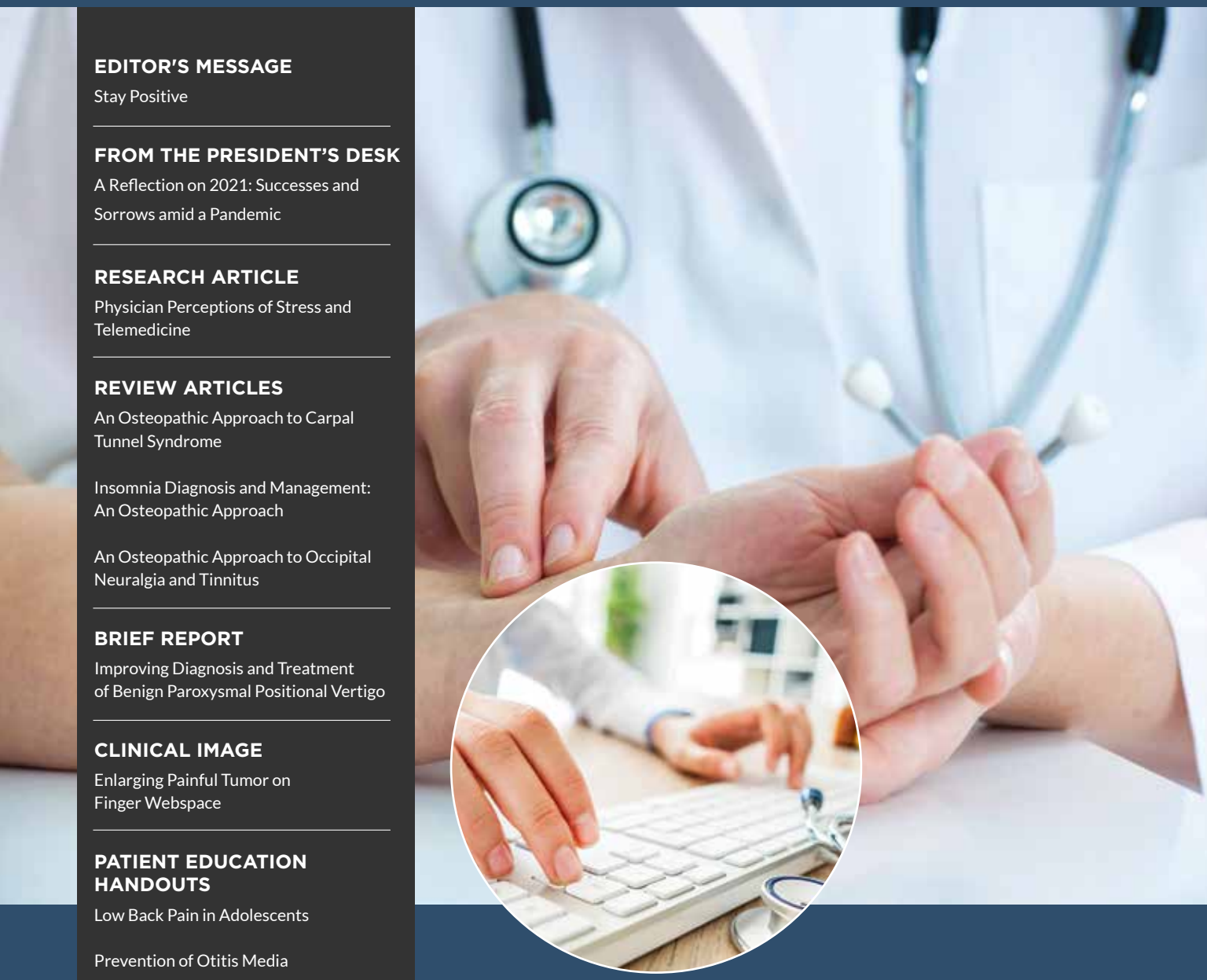

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EDITOR'S MESSAGE

Stay Positive

Ronald Januchowski, DO, FACOFP, Editor, *Osteopathic Family Physician*

I like to think of myself as a pragmatic realist. For those professional philosophers in the audience, I realize that there are theories that would say these two are implicative of each other; others might say that it is, in fact, a redundant phrase. As an amateur philosopher with slight pedantic goat leanings, I like to define it as recognizing the world for what it is, but believing there is always something more if the proper searching is done. People search for truth, for peace, for many things that will help life become more fulfilling and create a positive nature to their lives.

If you are searching, why not make a scholarly activity out of your search? I would encourage you to review our call for papers or perhaps submit an original article for publication. The submission process is not difficult; perhaps even easier than the prior authorization you recently completed. Check out ScholarOne Manuscripts™, the official internet host for Osteopathic Family Physician (OFP), for more information at acofp.org/OFPSubmission. There, you will be able to create an account and find FAQs and user guides to help with your submission.

Medical writing is one component of a comprehensive skill set that I think all physicians should attempt to master. As any skill, it may take a little time and help to become competent. This issue has excellent examples of brief review articles and reports that are relevant to our audience and can serve as templates for your future work. Osteopathic family physicians have much to offer, and *OFP* can serve as a venue for those ideas. As a final note, *OFP* has writing mentors to assist those who wish to improve upon their skills. I hope to hear from many of you soon.

Take care of yourself and those around you. Enjoy this issue of *Osteopathic Family Physician*.

FROM THE PRESIDENT'S DESK

A Reflection on 2021: Successes and Sorrows Amid a Pandemic

Nicole Heath Bixler, DO, MBA, FACOFP
ACOFP President

As 2021 ends, it is a perfect time to reflect on what this year has meant to me as your ACOFP president. Serving in this role since October 2020 has afforded me the unique opportunity to lead the organization with two different slates of elected Boards of Governors, two groups of appointed committee members and a few staffing changes. I have been able to appoint dynamic task forces responsible for significant proposed changes in our governance structure and the immersion of diversity, equity and inclusion (DEI) in all matters at ACOFP. I have signed countless letters advocating on behalf of our physicians, residents, and medical students and our collective patients. But sadly, I have not had the chance to be with you—my ACOFP family—in person. It has certainly been a time filled with immense pride in our organization, while navigating one of the most isolating and often disheartening times in my career.

March 2020 will forever be the timestamp of COVID-19—disrupting our way of life and making ACOFP pivot quickly to adjust our leadership succession, our delivery of continuing medical education (CME) and our way of conducting business for our specialty college. Little did we know those adjustments would be ongoing throughout 2021, not only out of necessity, but also because of our profession's changing demographic.

Being a part of the committee member appointment process for the past four years has shown me that our changes have inspired more people to volunteer, new leaders to emerge and the objectives of each committee to be attained. Through the work of the CME Advisory Committee and the respective CME Work Groups, we have successfully produced three more virtual CME events in 2021: the 58th Annual Convention & Scientific Seminars, the 2021 Intensive Osteopathic Update and OMED 2021.

Through the leadership of Speaker Elizabeth Palmarozzi, DO, FACOFP, and Vice Speaker Antonios Tsompanidis, DO, FACOFP, as well as the expertise and hard work of our staff, we also conducted an entirely virtual Congress of Delegates. The participation in these virtual events has rivaled the numbers we have ever had at our in-person events and has allowed members who may not traditionally participate to see what ACOFP truly has to offer.

I think this "new participation" has been most evident in our Task Force on DEI. I am proud not only of the work that has already been accomplished by this group but also the action plan that has been formulated for our path forward. Based on the group's recommendations, ACOFP has expanded its membership profile to be more inclusive of sexual identity, ethnicity and military service so that we can better understand various aspects of our membership and help foster welcoming environments for all. We have devised a unified statement as to the reason for our efforts in the DEI arena, and we are expecting resolutions to be presented during our upcoming Congress that will solidify the policy positions of ACOFP in all matters related to DEI.

I have been educated by the stories and experiences of these task force members, as well as inspired by other members who have shared their own accounts through personal blog posts. There is still so much work to be done, and I am confident that ACOFP President-elect Bruce R. Williams, DO, FACOFP, and the Board of Governors will continue to support these efforts for many years to come.

There has also been a significant amount of time and resources spent on analyzing whether our current governance structure is meeting the needs of our organization. The Task Force on Governance has worked with an external consultant—the Association Management Center—over the past year to discuss whether changes would allow for more diversity in our leadership, more transparency in our processes and more efficiency in implementing new programs for our membership. It is hopedthat this work will culminate in meaningful modernization, ultimately advancing ACOFP in its mission and engaging future family physicians who represent the populations we serve.

Our advocacy efforts in 2021 have focused on the continuous protection of patients and the family physicians who care for them. We have been supportive of efforts to continue COVID-19 relief funding and to make vaccines, treatment and personal protection equipment widely available. We have co-signed or authored statements in support of the universal vaccination of healthcare workers, as well as the requirement that children wear masks in school, following the U.S. Centers for Disease Control and Prevention's guidance.

We have also worked with other family medicine organizations to address the family physician shortage, advocate for the preservation of the family medicine care model and focus on vulnerable populations by reducing racial disparities. The work of our Federal Legislative & Advocacy Committee—in tandem with our Washington, D.C.-based lobbying group, Alston & Bird—has been invaluable in reviewing legislation that is pertinent to our mission and objectives as osteopathic family physicians.

So, on paper (and on Zoom calls), 2021 has been very successful for ACOFP in so many ways. It has been my honor to serve this organization and to advance the work that has been part of my personal focus since 2019 when serving as president-elect. At that time, a Task Force on Convention Innovation was my main objective, convening to reimagine the delivery of our annual convention through its experience and CME offerings.

So, on paper (and on Zoom calls), 2021 has been very successful for ACOFP in so many ways. It has been my honor to serve this organization and to advance the work that has been part of my personal focus since 2019 when serving as president-elect.

I am very much looking forward to our meeting in March 2022 to see how those ideas come to life as they were supposed to two years ago. I am excited for the camaraderie and fellowship experience, the newly designed lecture schedules and the recognition of award recipients and fellows from the past few years. It should be a celebration of a sense of normalcy and a break from the day-to-day that has not been kind to everyone.

We have all experienced personal and clinical situations that we never imagined we would. We have witnessed hostility and division over public health matters. We have all felt isolation, burnout and, often, a feeling of underappreciation for the jobs we do every day. We have seen the education of our students and residents impacted. We have not been able to exchange an "osteopathic hug" with many of our patients and colleagues.

I have greatly missed the opportunity to represent ACOFP at state meetings and ACOFP student chapter meetings—the very situations that I have always felt most at home in expressing my love and passion for osteopathic family medicine. However, I am grateful for this rare opportunity to have served as your president for more than a year and hope that I have done so in a way that exemplifies all that ACOFP embodies. Wishing you all a healthy end to 2021 and the hope for a better 2022!

Osteopathically,

Nicole Heath Bixler, DO, MBA, FACOFP

RESEARCH ARTICLE

PHYSICIAN PERCEPTIONS OF STRESS AND TELEMEDICINE

Jenna Guma, DO[1]; Katelyn Klimowich, DO[1]; Juming Pan, PhD[2]; Philip Collins, DO[1]; Danielle Cooley, DO, FACOFP[1]

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ABSTRACT:

Introduction: Telemedicine is an emerging field in which physicians can interact electronically with patients to improve health. During the COVID-19 pandemic, the use of telemedicine has grown exponentially. As physicians work to provide equally high-quality care for their patients remotely, their experiences must be considered.

Methods: This study utilized an online anonymous survey of physicians to assess their satisfaction, comfort level and student involvement when using telemedicine for patient care.

Results: Overall, physicians' experiences with the integration of telemedicine into their practices varied based on gender, the presence of medical students, age and prior experience with telemedicine. Physicians are more comfortable with telemedicine now than they had been prior to the start of the COVID-19 pandemic, and physicians who had prior experience were less likely to find it stressful to incorporate. Physicians in both the youngest (30–39 years old) and oldest (60 and older) categories reported the highest levels of satisfaction with telemedicine. Female physicians indicated they will be more likely to incorporate more telemedicine into practice in the future, beyond the COVID-19 pandemic. Of the specialties surveyed, family physicians report the lowest levels of comfort and satisfaction with telemedicine.

Conclusion: Physician respondents of this survey provided valuable data on the perceptions of the widespread incorporation of telemedicine during the COVID-19 pandemic. Further research can follow which physicians choose to keep telemedicine integrated into their practices and how the demand for these virtual visits may change in the coming months.

BACKGROUND

Telemedicine, also called telehealth, is an emerging field in which physicians are able to interact electronically with patients to improve health. Telemedicine can be performed through virtual platforms such as email, telephone and video, and can provide or augment care to a multitude of patients.[1] The benefits of telemedicine include increasing access to care in areas where there are provider shortages, decreasing travel burden on patients and assisting in diagnosis when utilizing video consultations.[2] In recent years, telemedicine has been implemented in all facets of health—from monitoring dialysis and diabetes outcomes to primary care and ophthalmology.[3,4,5,6] During the novel coronavirus (COVID-19) pandemic, the use of telemedicine has grown exponentially in an effort to continue to see patients and manage their care.[7] The unprecedented era of social distancing and overloaded hospital systems has led many primary care providers and specialists to rapidly develop these capabilities in their practices.[8] As we have seen with other natural disasters and emergency situations, the increased use of telemedicine and tele–mental health helps clinicians provide quality care remotely and safely.[9]

As physicians work to provide equally high-quality care for their patients remotely, patient outcomes and satisfaction in response to these changes must be considered. Though its use was encouraged by the pandemic, telehealth plays the role of improving patient care despite extenuating environmental circumstances. Studies of post-traumatic stress disorder treatment delivered through telehealth and in-person services found that patient satisfaction levels were equivalent.[10] For diseases like type 1 diabetes, regular check-ins with patients about their challenges and goals are important for preventing acute illness and hospitalizations. One

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way to increase the consistency of patient-reported outcomes is to deliver more patient-centered care through methods such as telehealth visits.[11]

Recently, more research has focused on assessing perceptions of telemedicine from the perspective of the provider teams, primary care offices, specialists and office staff. Physicians have been noted to feel positively toward the incorporation of telemedicine into their practices, citing benefits such as improved access to services and increased care delivery, quality control of screening programs, and reduced health care costs.[12,13] During the pandemic, a study of rheumatologists found that telerheumatology is helpful for increasing access to care and quality of care, but more helpful for management of rheumatologic conditions than for initial diagnosis. Another study found that switching to telemedicine was well accepted in rheumatologists' practice, and not making the switch could have deprived approximately three-quarters of these patients of proper medical care, leading to self-medication or stopping of their drugs.[14] Other studies assessing provider perceptions of telemedicine in palliative care demonstrated positive perceptions, with providers reporting that they felt telemedicine was safest when care was delivered by an experienced provider, patients had access to a reliable caregiver and the patient was assessed at least once.

Physicians have also cited drawbacks and barriers to providing care. Lack of a comprehensive physical exam is often cited as the biggest barrier.[15] Though this issue can be somewhat mitigated through detailed descriptions of techniques, and osteopathic physicians would do well to know that osteopathic manipulative treatment can still occur through similar descriptions,[16] this often involves reliance on caretakers or family members of the patients. Other drawbacks cited include a breakdown in the relationship between health professional and patient, a breakdown in the relationships among health professionals, issues concerning the quality of health information, organizational and bureaucratic difficulties, and difficulty implementing new technologies and associated training.[12,17,18] While research has been conducted assessing telehealth in the past, our project uniquely surveyed physicians during the widespread rapid shift into telehealth, where some providers were left with this as their only option to see patients. During this time, some physicians might have made the personal choice to switch to conducting telehealth visits, while others were directed to do so by their employer or group. Our project aimed to better assess the perception, comfort level and experiences of physicians using telehealth during the onset of the COVID-19 pandemic. By gathering more data on physicians' experiences with telehealth, we can improve the experience for both physicians and patients to ultimately provide better care.

METHODS

This study used an online anonymous survey developed by the researchers (Appendix A). The perceived stress scale[19] (PSS) was included as well to assess stress levels of study participants. PSS is the most widely used instrument for measuring the perception of stress. It is a measure of the degree to which situations in one's life are appraised as stressful and can evaluate the degree to which individuals believe their life has been unpredictable, uncontrollable and overloaded. The assessed items are general in nature rather than focusing on specific events or experiences.[20] It is based on the transactional theory of stress—a theoretical approach that focuses on how individuals perceive stress, which is seen as the result of an imbalance between situational demands and coping resources. A higher score on the PSS indicates a higher stress level, and the score has been associated with health outcomes such as hormonal changes, cardiometabolic disease, insomnia and decreased cognition.[21] Given the impact of the pandemic and its global effects on mental health, we felt this was an appropriate tool for measuring the stress of the survey respondents. Most, if not all, respondents would likely label the COVID-19 pandemic as a "stressful event"; however, how each person internalizes, copes with and is impacted by that stress will differ. The questions in the PSS ask about feelings and thoughts during the previous month. In each case, respondents are asked how often they felt a certain way. PSS scores are obtained by reversing responses. Positively stated items on the PSS scale (statements 28, 29, 31 and 31 in Appendix A) are reversed (1=5, 2=4, 3=3, 4=2 and 5=1), then summing across all scale items.

The survey was distributed online via Qualtrics and was sent via email invitation to all physician members of the New Jersey Association of Osteopathic Physicians and Surgeons (NJAOPS) with permission of the NJAOPS executive director. It was distributed in May and June 2020, approximately 2–3 months into the stay-at-home orders resulting from the COVID-19 pandemic. The survey was in multiple-choice format, allowing for objective data. Using five-point Likert scale responses, subjects were asked about their satisfaction with and comfort using telemedicine for patient care. There are 5 levels of satisfaction: very satisfied (a 5 on the Likert scale), satisfied (4), neutral (3), dissatisfied (2) and very dissatisfied (1). Similarly, there are 5 comfort levels: very comfortable (a 5 on the Likert scale), comfortable (4), neutral (3), uncomfortable (2) and very uncomfortable (1). Therefore, a higher score means the participant is more satisfied and comfortable with telemedicine. Participants were also asked about their perceptions of medical student involvement in telemedicine. This study was approved by the Rowan University IRB.

Respondents were also asked demographic questions including age (categorized into age groups of 30–39, 40–49, 50–59, 60–69, or 70–79 years old), race and specialty. Additional questions included whether the respondents had any experience with telemedicine prior to the COVID-19 pandemic, whether medical students had been included in their telemedicine visits, and what percentage of patients were seen via telemedicine.

RESULTS

Of the approximately 5,000 physicians potentially reached through the NJAOPS mailing list, only 83 completed the survey. Of the respondents who identified their gender, 35 identified as female and 34 identified as male. Of the physicians who responded to the question about specialty, the breakdown was: 31 in family medicine, 1 in dermatology, 9 in internal medicine or a subspecialty, 7 in pediatrics or a subspecialty, 1 in physical

medicine and rehabilitation, 11 in psychiatry, 1 in surgery or a subspecialty, and 11 in other fields not indicated. Overall, physicians' experiences with the integration of telemedicine into their practices varied based on gender, the presence of medical students, age and prior experience with telemedicine. To test the statistical significance in terms of mean PSS scores among these groups, the data was analyzed using *t* tests (if there were 2 categories) and one-way analysis of variance (if there were more than 2 categories), assuming all the physicians are independent. Significance level α=0.1 was used through the study. Statistical Software R and JMP were used for the analyses. The results show that different age groups have significant levels of perceived stress, yet PSS scores are not significantly different among variations in gender, race, prior experience with telemedicine, the presence of medical students or telemedicine volume. Table 1 summarizes the PSS scores across the demographics of the physicians who responded.

TABLE 1:

Summary of Perceived Stress Scores

Category	N	Mean	Standard Deviation
Gender			
Female	35	14.94	5.49
Male	34	14.97	9.47
Race			
White	62	15.38	7.64
Black	2	13.2	1.41
Other	5	6	7.69
Age			
30–39	10	17.5	6.87
40–49	15	14.53	7.62
50–59	15	18.4	9.60
60–69	11	11.18	5.90
70–79	4	4.5	1
Prior Telemedicine Experience			
No	55	15.58	7.76
Yes	14	12.5	6.95
Medical Students			
No	28	15.10	6.71
Yes	39	14.10	8.00
Telemedicine Volume			
<25%	16	18.5	9.05
25%–49%	8	14.25	6.04
50%–74%	5	15.2	5.36
75%–99%	14	14.86	8.50
100%	20	15.55	5.32

Regarding the perception of telemedicine, the primary results of this study show physicians aged 30–59 years old had the highest levels of perceived stress, with age group 50–59 years old ranking first in that category. Physicians aged 70–79 years had the lowest levels of perceived stress. Interestingly, it was both the youngest (30–39 years old) and oldest (60 and older) who reported the highest levels of satisfaction with telemedicine (*P*=.0374). While they reported high levels of satisfaction with telemedicine, physicians age 30–49 were more likely to find the pandemic stressful, and physicians aged 60 and older were less likely to find the pandemic stressful (*P*=.0024).

Perhaps not surprisingly, physicians who had not previously used telemedicine were more likely to find it stressful to incorporate (*P*=.0702). Along those same lines, physicians were more comfortable with telemedicine at the time of the survey than prior to the pandemic (*P*<.0001). This was further explored by gender and it was found that, while not statistically significant, female physicians were more comfortable with telemedicine than male physicians (*P*=.0862). Female physicians also indicated they will be more likely to incorporate more telemedicine into practice in the future, beyond the COVID-19 pandemic (*P*=.007).

Finally, among the differences in specialties, family physicians indicated the lowest levels of satisfaction (*P*=.0172) and lowest levels of comfort (*P*=.0282) regarding use of telemedicine.

DISCUSSION

Overall, physicians' experiences with the integration of telemedicine into their practices varied based on gender, the presence of medical students, age and prior experience with telemedicine. Physicians are more comfortable with telemedicine now than they had been prior to the start of the COVID-19 pandemic. This may not be surprising, but it is important, as many physicians worked to rapidly integrate telemedicine into their practices, and, in doing so, their offices made meaningful, long-term changes. Newly comfortable with this modality to provide care to patients, many physicians may continue to utilize telemedicine after the resolution of the COVID-19 pandemic. This idea of continued use of telemedicine is supported by physician responses indicating that those who have utilized telemedicine are more likely to incorporate telemedicine into their practice in the future after the COVID-19 pandemic, and those who are satisfied with telemedicine are more likely to use it again in the future.

Physicians who have not previously used telemedicine are more likely to find utilizing telemedicine more stressful. This can be attributed to the myriad of stressors and new variables associated with converting to a virtual practice. The challenges faced by switching to telemedicine visits impact all aspects of patient care and office efficiency; such challenges include difficulty building and maintaining relationships with patients; difficulty assessing the patient; technological difficulties for patients, families, office staff and physicians; lack of continuity of care; and need for additional technological training. These changes and challenges pose a large learning curve for physicians and their practices, and it becomes

clear how prior experience would mitigate this stress. By further examining some of these stressors and variables, we can learn how to most efficiently incorporate and maintain telemedicine in practices to provide efficient and patient-centered care.

The survey found that female physicians are more comfortable with telemedicine than male physicians, and female physicians were also more likely to incorporate telemedicine into their practices in the future. This pattern is consistent with data acquired by Doximity, where female physicians were adopting telemedicine at a much higher rate (25%) than male physicians.[22] This could be related to female physicians being more likely to work part time[23] and more likely to be interested in the idea of seeing patients from home or somewhere other than the traditional medical office. Though some physicians partake in their telemedicine visits in their traditional offices, many of them are able to participate in these visits from the comfort of their own homes. This allows them to expand their hours, eliminate their commute times and better accommodate their lifestyles. It is also an attractive option for physicians who are parents or caregivers, have burdensome commutes, or also work in academic medicine. Though this survey only reflected a preference for female physicians, it has implications for benefits for many physicians to achieve balance in their career, as well as improved work-life balance and integration.

Physicians who had medical students with them during the integration of telemedicine reported less stress than those who did not have students, though this difference was not found to be significant. This could be attributed to offices that utilized medical students as a resource during times of rapid change in their offices. Medical students have utility in helping office staff contact patients, setting up video or phone appointments, scribing, triaging, and waiting with patients virtually before their visit.[24,25] A shorter wait time, more assistance and more virtual human contact for patients may also be associated with higher patient satisfaction, which could extend to an improved experience for the physician. The added component of teaching via telemedicine may provide teaching attending physicians with a sense of normalcy and opportunity for mentorship, something that may boost overall satisfaction and decrease stress for teaching attending physicians. Though the educational experience is vastly different and can be lacking in areas such as physical diagnostic skills, patient volume and diversity of pathologies, it provides other unique learning opportunities such as triaging patients, developing virtual diagnostic skills and building patient rapport virtually, making for a potentially unique experience for both the physician and the student.

Physicians ages 30–49 are more likely to find the pandemic stressful, according to our findings. Physicians who are 60 years and older are less likely to find the pandemic stressful. This is consistent with data on anxiety, depression and emotional response during the pandemic stratified by age group. A study using PSS, General Anxiety Disorder-7 and Patient Health Questionnaire-9 scales found the highest response among those aged 25 years or younger and lowest among those aged 60 years or older, with prevalence rates and the mean scores for stress, anxiety and depression on standardized scales decreasing from younger to older individuals.[26] Similar results were found examining symptoms of anxiety disorder or depressive disorder, COVID-19–related trauma- and stressor-related disorder, initiation of or increase in substance use to cope with COVID-19–associated stress, and serious suicidal ideation.[27] This could be due to younger adults experiencing more coronavirus-related daily stressors, having lower perceived coping efficacy, having a higher likelihood of being a parent or caregiver, or having a higher prevalence and/or willingness to report anxiety.[28]

Finally, perhaps the most interesting finding of this study is that family physicians report the lowest levels of comfort and satisfaction with telemedicine. While we did not investigate a cause for this, one could attribute a number of potential etiologies. The rapid transition to telemedicine at the start of the COVID-19 pandemic was likely difficult for most physicians, but family physicians often have long-standing relationships with their patients, and switching to a more physically distant, remote type of interaction may be challenging for some. Additionally, the physicians surveyed practice in a location which had higher-than-average rates of COVID-19 cases at the time of the study. Many physicians likely felt a great deal of pressure to accurately triage and diagnose their patients via telemedicine encounters. While these causes are speculative, one can assume the pandemic played a major role in the physicians' feelings toward telemedicine. Further research is needed in this area.

This study is limited by the number of responses and the limited geographical location of those who responded. Further research could extend into other states to compare the use of telemedicine across other regions. Further research should also evaluate the causes of some of these findings, such as why family physicians are less comfortable and satisfied with telemedicine and why female physicians overall seem more comfortable with telemedicine. Additionally, it would benefit medical schools to examine why physicians with students seem to view telemedicine more positively than physicians without students. This could serve as an important factor in preceptor recruitment and training. It will be worth examining how these perspectives change as the need for socially distanced learning decreases.

Telemedicine has provided a unique opportunity for both patients and physicians to engage in care remotely that might be preferable for some. Further research could follow which physicians choose to keep telemedicine integrated into their practices, as well as how and why they make that choice. Further research can also follow how the demand for these virtual visits changes as the need for social distancing decreases in the coming months.

CONCLUSION

In summary, physician respondents of this survey provided valuable data on the perceptions of the widespread incorporation of telemedicine during the COVID-19 pandemic. There are many factors in determining one's comfort, satisfaction and stress, and this study serves as a first step in determining some of these dynamics.

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APPENDIX A:

PHYSICIAN PERCEPTION OF TELEMEDICINE SURVEY

** Indicates question logic was used based on prior responses*

1. Have you utilized telemedicine for patient care?
   1. Yes
   2. No

2. *If so, how recently did you first use telemedicine?
   1. <2 weeks ago
   2. 2–6 weeks ago
   3. 7–12 weeks ago
   4. 3–6 months ago
   5. >6 months ago

3. *If so, what percentage of your typical patient volume are you currently seeing via telemedicine?
   1. 100%
   2. 75%–99%
   3. 50%–74%
   4. 25%–49%
   5. <25%

4. *If using telemedicine, please rate your overall level of satisfaction with your experience with telemedicine.
   1. Very dissatisfied
   2. Dissatisfied
   3. Neutral
   4. Satisfied
   5. Very satisfied

5. In the past 2 years, have you had any medical students work with you in your practice?
   1. Yes
   2. No

6. *If using telemedicine, have you had any medical students working with you using telemedicine?
   1. Yes
   2. No

7. *If so, please rate your level of satisfaction with the student(s) and their participation in telemedicine.
   1. Very dissatisfied
   2. Dissatisfied
   3. Neutral
   4. Satisfied
   5. Very satisfied

8. Prior to the COVID-19 pandemic, did you have any experience with telemedicine as a physician?
   1. Yes
   2. No

9. Please rate your level of comfort with telemedicine prior to the COVID-19 pandemic.
   1. Very uncomfortable
   2. Uncomfortable
   3. Neutral
   4. Comfortable
   5. Very comfortable

10. Please rate your current level of comfort with telemedicine.
    1. Very uncomfortable
    2. Uncomfortable
    3. Neutral
    4. Comfortable
    5. Very comfortable

11. *Please rate your level of comfort in having a student present a case to you via telemedicine.
    1. Very uncomfortable
    2. Uncomfortable
    3. Neutral
    4. Comfortable
    5. Very comfortable

12. *I feel a telemedicine clerkship is equal to the traditional in-person clerkship experience for medical students.
    1. Strongly agree
    2. Agree
    3. Neutral
    4. Disagree
    5. Strongly disagree

13. I feel that telemedicine can serve as an effective replacement for in-person clerkships for medical students during the COVID-19 pandemic.
    1. Strongly agree
    2. Agree
    3. Neutral
    4. Disagree
    5. Strongly disagree

14. I feel that telemedicine is an effective replacement for in-person clerkships regardless of the COVID-19 pandemic.
    1. Strongly agree
    2. Agree
    3. Neutral
    4. Disagree
    5. Strongly disagree

15. I feel that telemedicine should be a required part of medical school curricula.
    1. Strongly agree
    2. Agree
    3. Neutral
    4. Disagree
    5. Strongly disagree

16. Do you feel more comfortable interacting with patients in person or via telemedicine?
    1. Telemedicine
    2. In person
    3. No difference
    4. I don't know

17. *Do you feel more comfortable interacting with medical students in person or via telemedicine?
    1. Telemedicine
    2. In person
    3. No difference
    4. I don't know

18. I am likely to incorporate more telemedicine into my practice in the future.
    1. Strongly agree
    2. Agree
    3. Neutral
    4. Disagree
    5. Strongly disagree

19. The COVID-19 pandemic has been stressful for me.
    1. Strongly agree
    2. Agree
    3. Neutral
    4. Disagree
    5. Strongly disagree

20. Incorporating telemedicine into my practice has been stressful.
    1. Strongly agree
    2. Agree
    3. Neutral
    4. Disagree
    5. Strongly disagree

21. I feel my patients have the appropriate technology and access necessary for telemedicine.
    1. Strongly agree
    2. Agree
    3. Neutral
    4. Disagree
    5. Strongly disagree

22. I feel I have the appropriate technology and access necessary for telemedicine.
    1. Strongly agree
    2. Agree
    3. Neutral
    4. Disagree
    5. Strongly disagree

23. I feel access to telemedicine should remain a priority following the COVID-19 pandemic.
    1. Strongly agree
    2. Agree
    3. Neutral
    4. Disagree
    5. Strongly disagree

24. Have you had to furlough or lay off any staff members as a result of the pandemic?
    1. Yes
    2. No
    3. Not my decision

The questions in this scale ask you about your feelings and thoughts during the last month. In each case, you will be asked to indicate *how often* you felt or thought a certain way.

25. In the last month, how often have you been upset because of something that happened unexpectedly?
    1. Never
    2. Almost never
    3. Sometimes
    4. Fairly often
    5. Often

26. In the last month, how often have you felt that you were unable to control the important things in your life?
    1. Never
    2. Almost never
    3. Sometimes
    4. Fairly often
    5. Often

27. In the last month, how often have you felt nervous and "stressed"?
    1. Never
    2. Almost never
    3. Sometimes
    4. Fairly often
    5. Often

28. In the last month, how often have you felt confident about your ability to handle your personal problems?
    1. Never
    2. Almost never
    3. Sometimes
    4. Fairly often
    5. Often

29. In the last month, how often have you felt that things were going your way?
    1. Never
    2. Almost never
    3. Sometimes
    4. Fairly often
    5. Often

30. In the last month, how often have you found that you could not cope with all the things that you had to do?
    1. Never
    2. Almost never
    3. Sometimes
    4. Fairly often
    5. Often

31. In the last month, how often have you been able to control irritations in your life?
    1. Never
    2. Almost never
    3. Sometimes
    4. Fairly often
    5. Often

32. In the last month, how often have you felt that you were on top of things?
    1. Never
    2. Almost never
    3. Sometimes
    4. Fairly often
    5. Often

33. In the last month, how often have you been angered because of things that were outside of your control?
    1. Never
    2. Almost never
    3. Sometimes
    4. Fairly often
    5. Often

34. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?
    1. Never
    2. Almost never
    3. Sometimes
    4. Fairly often
    5. Often

35. Please indicate your age ____

36. Which gender do you identify with most?
    1. Male
    2. Female
    3. Other

37. How do you describe yourself?
    1. Asian
    2. Black or African American
    3. Native American or Alaska Native
    4. Pacific Islander
    5. White/Caucasian
    6. Other

38. Are you of Hispanic, Latino or Spanish origin?
    1. Yes
    2. No

39. Which of the following best describes your practice setting?
    1. 100% inpatient and 0% outpatient
    2. 75% inpatient and 25% outpatient
    3. 50% inpatient and 50% outpatient
    4. 25% inpatient and 75% outpatient
    5. 0% inpatient and 100% outpatient

40. Which of the following best describes the community in which you practice?
    1. Urban
    2. Suburban
    3. Rural

41. Please indicate your specialty.
    1. Family medicine
    2. Internal medicine or subspecialty
    3. Surgery or subspecialty
    4. Anesthesia
    5. Dermatology
    6. ENT
    7. Ophthalmology
    8. Orthopedics
    9. Physical medicine and rehab
    10. Neurology
    11. Neurosurgery
    12. Urology
    13. Pediatrics or subspecialty
    14. Psychiatry
    15. Emergency medicine
    16. Other

REVIEW ARTICLE

AN OSTEOPATHIC APPROACH TO CARPAL TUNNEL SYNDROME

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Median nerve

Neuropathy

OMT

Wrist

ABSTRACT:

Carpal tunnel syndrome (CTS) is a common cause of medical and workforce-related expenses in the United States. It is also frustrating for patients who have difficulty using the affected hand, impairing their activities of daily living and decreasing their quality of life. By utilizing the philosophy of osteopathic medicine, providers can better implement a treatment plan by working with the patient to find one that incorporates all aspects of the patient's environment. By using the practice of osteopathic manipulative therapy (OMT), osteopathic physicians can often effectively treat the patient's symptoms without side effects found in medications. This is especially useful in patients who may be unable to take certain medications, such as pregnant patients. Other treatment modalities are also reviewed in this manuscript.

INTRODUCTION

Carpal tunnel syndrome (CTS) is a common peripheral neuropathy caused by the median nerve's compression as it passes through the carpal tunnel. Symptoms of numbness, tingling and pain usually occur gradually in the hand's palmar surface and primarily affect the thumb, index finger, middle finger, and ring finger. Severe symptoms include the impaired motor function of the wrist and hand and weakened grip. CTS is primarily an overuse injury of the hand or wrist but is also associated with systemic disorders such as pregnancy, obesity, diabetes mellitus and hypothyroidism. It also may be caused by trauma.[1]

CTS has been associated with reduced quality of life. It mainly affects middle-aged adults, although children can be affected as well. Because CTS is especially common for working adults, it is associated with decreased productivity, psychological distress and overall lower quality of life due to poor hand function and discomfort. This results in increased financial burden and healthcare costs for patients suffering from CTS, with an estimated $45,000–$89,000 income loss per CTS patient over 6 years and the total cost associated with CTS in the United States passing $2 billion annually.[2,3] Surgery is among the most used interventions, which further increases CTS's economic toll and delays patients' ability to return to work.

The authors believe that osteopathic manipulative treatment (OMT) may have an effective role in treating CTS and could decrease the economic and lifestyle burdens associated with the dysfunction. This article aims to explain the osteopathic findings of CTS and the manual approach to treatment.

EPIDEMIOLOGY

CTS is the most common peripheral neuropathy syndrome worldwide, with an incidence of 99/100,000 cases per year and a 7%–19% prevalence rate in the general population.[4–6] Most studies suggest that CTS occurs more commonly in women than men, having a frequency of 9.2% for women compared to 6% for men.[7] Incident rates for women peak between ages 45 and 54, although incidence rates continue to increase with age for men.[8] Certain systemic conditions are associated with an increased occurrence of CTS. Diabetics without neuropathy have a prevalence rate of 14%, and those with neuropathy have a 30% prevalence rate.[7] For pregnant women, the incidence of CTS has been reported up to 62%, likely due to hormonal and musculoskeletal changes.[9,10] The contributing factors to the development of CTS in hypothyroidism and the thyroid stimulating hormone's role are not clearly understood. It has been suggested that mucinous deposition onto the median nerve may increase the likelihood of CTS development, especially in combination with repetitive movements of the wrist.[11] Increased body mass index (BMI) due to hypothyroidism may also contribute to the development and severity of symptoms.

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SYMPTOMS

The main symptoms of CTS are caused by compression of the median nerve as it crosses the carpal tunnel. Patients typically complain of pain and a sensation of numbness in the distribution of the median nerve (the ipsilateral thumb, index, middle, and sometimes the radial half of the 4th finger). This distribution is variable in patients based on where the compression is occurring and their unique anatomy. Some patients may report worse symptoms at night, resulting in nighttime wakening. This may be temporarily ameliorated by shaking the hand or running water over the hand. Many patients report bilateral symptoms, although the severity may be different for each hand. Activities that involve flexion or extension at the wrist may exacerbate symptoms. Patients may describe difficulty in playing sports, cooking, typing or other activities. Some notice their manual dexterity has diminished on the affected side.[12]

RISK FACTORS

Although CTS affects a wide range of patients, it is particularly common in working-age adults due to repetitive hand use such as writing or typing. CTS is also associated with obesity, with an 8% increased risk of developing CTS for every 1 unit increase in BMI.[13] A small portion of CTS cases are correlated with endocrine disorders such as diabetes mellitus, hypothyroidism and acromegaly. Inflammation of the wrist due to trauma or inflammatory rheumatic disorders are also risk factors for developing CTS.[14]

ANATOMY

The carpal tunnel is located at the proximal palmar wrist, surrounded by carpal bones on the “floor” and “side walls” of the structure with the transverse carpal ligament composing the "roof" of the tunnel.

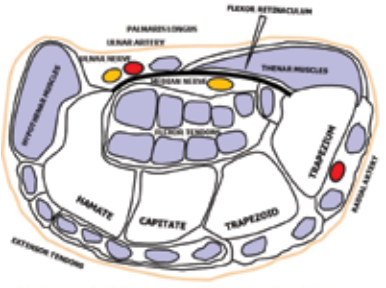
FIGURE 1:

Bones of the carpal tunnel

Its contents include 9 flexor tendons and the median nerve.

FIGURE 2:

Cross section of distal carpal tunnel

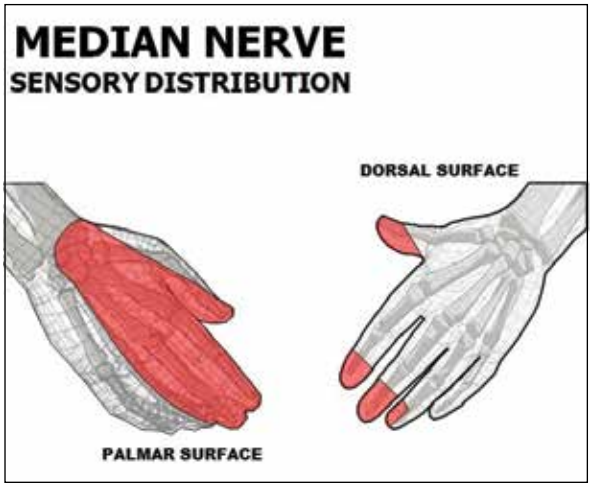


CROSS SECTION OF DISTAL ROW OF CARPAL TUNNEL

The median nerve supplies motor innervation to the thenar muscles and sensory innervation to the thumb, index finger, middle finger and radial side of the ring finger. Thus, entrapment of the median nerve in CTS patients is responsible for pain and paresthesia in these fingers and muscle weakness in pinching and other grasping maneuvers. Entrapment of the median nerve may arise from mechanical compression due to swollen flexor tendons or edema but can also be caused by other forms of injury, such as ischemic stress on the median nerve. Loss of sensation to the palm is usually spared in CTS because palmar cutaneous sensory branches of the median nerve typically branch proximal to where the nerve passes through the carpal tunnel. Hence, entrapment of the median nerve within the carpal tunnel characteristically affects the sensation of the radial 3½ fingers but not the palm.[15,16]

FIGURE 3:

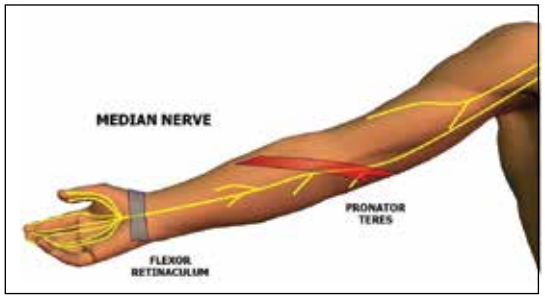
Median nerve distribution



Symptoms that affect the medial side of the 4th finger should raise suspicion of ulnar nerve compromise that could originate in the Guyon canal, between the olecranon and the medial epicondyle or higher.

FIGURE 4:

Median nerve path



Dorsal symptoms should also lead to the possibility of radial nerve involvement. Palpatory findings of the skin or subcutaneous changes and observation of Dupuytren’s contractures may indicate fascial and ligamentous thickenings that would narrow the volume, especially at the flexor retinaculum. Localized pain on movement

may also include suspicion of other clinical phenomena, such as tendinitis, tenosynovitis, ganglion cysts, arthritis trigger fingers, etc. Any condition that results in weakness (eg, multiple sclerosis, amyotrophic lateral sclerosis, Guillain-Barré syndrome), pain and swelling (eg, Raynaud's syndrome, systemic lupus erythematosus, gout) or space-occupying lesions (eg, amyloidosis, lipomas), and more central neurological impairment (eg, stroke, Parkinsonism, spinal cord compression, brachial plexopathy, thoracic outlet syndrome) and other musculoskeletal conditions (eg, Charcot-Marie-Tooth disease, complex regional pain syndrome, fibromyalgia) may contribute to or mimic elements of CTS. The determination of one of these diagnoses does not exclude the possibility that several neuromusculoskeletal problems may be occurring simultaneously.

PATHOPHYSIOLOGY

As the median nerve passes through the carpal tunnel, it is at risk for compression and subsequent ischemic damage. Unlike the normal pressure of 5 mm Hg in the carpal tunnel at rest, activities like typing increase the pressure to a level high enough that blood flow to the nerve is impaired and the risk for ischemia increases.[17] As the pressure continues to rise, ischemia transitions from a transient phenomenon to one that causes more permanent damage to the nerve. The pattern of damage begins with sensory demyelination, which then progresses to motor demyelination; ultimately, the loss of functioning of the axons of sensory and motor branches will result and the patient's symptoms will progress.[17] The loss of neuronal input to the hand and wrist muscles leads to sensory loss in the distribution of the median nerve and motor axon involvement contributes to atrophy of muscles innervated by the affected nerve and its branches. This damage is responsible for the pain, tingling and weakness experienced by the patient. Other causes of ischemia include stretching or thickening of connective tissue in the carpal tunnel that impinges on the median nerve.[17] Thenar eminence atrophy and subsequent hand weakness are late complications of severe carpal tunnel syndrome that is inadequately treated or for which the patient has not sought timely evaluation and treatment.[18]

CORRELATION WITH PREGNANCY

During pregnancy, hormonal changes or the onset of lactation alters the fluid distribution among the compartments in the body and puts the patient at greater risk for median nerve compression. Although it is commonly believed that CTS is most prevalent during the third trimester, a woman can develop it at any time during the pregnancy or post-delivery. The persistence of symptoms postpartum may contribute to increased retreatment rates among pregnant women compared to nonpregnant patients. Early treatment should focus on conservative measures, such as splinting and/or injections; neuropathic pain medications are to be avoided to prevent effects on fetus development.[18] Sometimes, patients experience gradual improvement without interventions. If symptoms persist postpartum, surgical decompression may be pursued.

PHYSICAL EXAM AND SPECIAL TESTS

A complete physical examination will include evaluating the upper extremity, including the glenohumeral joint, elbow, wrist and hand. There can be single, double, triple and even quadruple "crush" phenomena contributing to the clinical condition. This phenomenon occurs when the nerve is compressed in more than one location, which can cause symptoms in other regions as well. The neck should also be examined to rule out other causes of symptoms, such as cervical radiculopathy or stenosis, affecting the nerve roots that contribute to forming the median nerve at a more proximal location.[19] Muscular strength testing and 2-point discrimination may also be performed to assess nerve function and distribution through the arm. Asymmetry of elicited tendon reflexes, including the triceps, biceps and brachioradialis, may contribute to refining the diagnosis. Special orthopedic tests for carpal tunnel syndrome include the Phalen maneuver (and reverse Phalen) and Tinel's sign at the wrist.

Phalen's maneuver: The patient's forearms are held parallel to the ground and instructed to place the posterior aspects of both hands against each other perpendicular to the forearms. Positive: reproduction of the symptoms in the median nerve distribution in a minute or less.

Reverse Phalen's maneuver: The patient's forearms are held parallel to the ground and instructed to place the anterior aspects (palms) of both hands against each other perpendicular to the forearms ("prayer" position). Positive: reproduction of the symptoms in the median nerve distribution in a minute or less.

FIGURE 5A:

Phalen's maneuver

FIGURE 5B:

Reverse Phalen's maneuver

FIGURE 6:

Tinel test

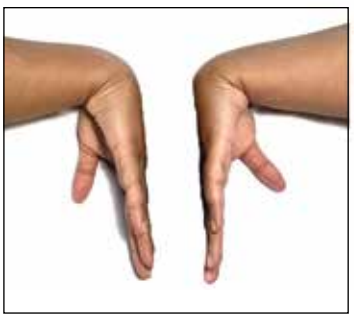
Tinel test: The patient's hand is in the supinated position and the physician taps vigorously with fingertips or reflex hammer over the median nerve in the region of the flexor retinaculum. Positive: reproduction of the symptoms in the median nerve distribution).

When compressing the median nerve over the carpal tunnel using Durkan's test, if symptoms are elicited within 30 seconds after the maneuver's induction, it is both a sensitive and specific test.[19] The carpal tunnel sign with the patient orienting the wrists at 90 degrees flexion may reproduce the symptoms.

Carpal tunnel sign: The patient's forearms are held parallel to the ground and instructed to place both hands at 90 degrees of flexion to the forearms. Positive test: reproduction of the symptoms in the median nerve distribution in a minute or less)

FIGURE 7:

Carpal tunnel sign



Nighttime pain and the flick maneuver are also indicators of CTS that can be obtained from the patient's history. Polyneuropathies and osteoarthritis must also be ruled out as causes for the presenting symptoms.[12] In addition, any test that places stress on the median nerve as it passes through the wrist may be used to diagnose CTS. Manual dexterity maneuvers, such as Froment's sign, the bottle sign, the nail sign and Ochsner's clasping test, may demonstrate movement deficits.

Froment's sign: The patient is instructed to grip a piece of paper between the thumb and radial side of the index finger. The physician attempts to pull the paper. Positive test: the patient will use the flexor pollicis longus (median nerve innervation) to flex the thumb interphalangeal joint as a substitute for a weakened adductor pollicis muscle, indicating ulnar nerve pathology.

FIGURE 8A:

Normal Froment's sign

FIGURE 8B:

Abnormal Froment's sign

Bottle sign: The patient is instructed to grip a bottle. Positive test: the inability to completely contour to the rounded surface of the bottle indicates palsy of the median nerve.

FIGURE 9A:

Normal bottle sign

FIGURE 9B:

Abnormal bottle sign

Nail sign: The patient is instructed to touch the tips of the nails of the thumb and index finger. Positive test: the inability to perform the maneuver indicates median nerve involvement.

FIGURE 10A:

Normal nail sign

FIGURE 10B:

Abnormal nail sign

Ochsner's clasping test: The patient is instructed to interlace the fingers of both hands. Positive: the index finger on the side of median nerve involvement will be unable to flex and will protrude.

FIGURE 11:

Ochsner's clasping test

Other pathologies, such as vascular circulation, should be addressed with the application of the Adson's and Allen tests. Adson's test involves having the patient extend and abduct their arm, then turn their head to the side being tested. A positive test is one with a diminished radial pulse due to compression of the subclavian artery by a cervical rib/muscle. The Allen test involves compressing the radial and ulnar arteries simultaneously, then, when the hand is pale, releasing pressure on one artery at a time to check for blood flow from each source. During examination, cervical etiology can be screened through Spurling's test—cervical compression via a caudad force on top of the head while the patient is seated. A positive test is indicated by radicular pain down the patient's arm. Cervical distraction—pulling the head cephalad, relieving pressure on the cervical nerves—may also be used, a positive test being an improvement in symptoms. The Hoffman test, although not extremely sensitive, is very specific for upper motor neuron impingement. The examiner conducts this test by holding the middle finger loosely, then flicking down the patient's middle fingernail, allowing the finger to extend upward reflexively. A positive test occurs when there is flexion and adduction of the thumb on the same hand.

OFFICIAL DIAGNOSTIC CRITERIA/ DIAGNOSTIC TESTING

The diagnosis of carpal tunnel syndrome is made based primarily on clinical evidence and physical examination; therefore, a thorough history and physical examination are extremely important in diagnosing and managing CTS. Factors such as paresthesias, muscle weakness, 2-point discrimination, thenar eminence atrophy, and the results of special tests must be obtained to form the diagnosis. Diagnostic testing that may be employed before the initial evaluation of CTS in the clinical setting may include electrodiagnostic studies, magnetic resonance imaging (MRI), computed tomography and x-rays.[20] The decision to use diagnostic imaging ahead of a clinical diagnosis is dependent on the physician's preference and may or may not affect the decision to decompress the carpal tunnel surgically. Electromyography (EMG) and nerve conduction studies are employed after the patient is evaluated in the clinical setting and are not traditionally employed as prediagnostic testing. Generally, these tests are not recommended prior to 6–8 weeks following the onset of symptoms, due to the greater potential of false-negative findings. Most frequently performed at the same session, these tests may not be easily tolerated by patients for various reasons. The National Institute for Occupational Safety and Health recommends evaluating the ergonomics of the workspace to optimize working conditions and minimize the development of CTS. Vibration, repetitive flexion and extension maneuvers, and the length of time over which these types of motions are performed in various occupations were evaluated in relation to activity factors and determined to increase CTS's risk as a workplace injury.[21] During the initial evaluation of CTS in the clinical setting, ergonomic factors should be explored and discussed with the patient to better understand the potential mechanisms for the development of CTS.

EMG AND INDICATIONS

The use of EMG and other electrodiagnostic techniques is reserved for confirmation of a clinical diagnosis and the exclusion of other mononeuropathies or damage to the median nerve more proximally. Ultrasound and electrodiagnostic testing may be performed before surgical intervention to validate CTS diagnosis and predict outcomes post-procedure. In studies performed comparing the 2 modalities, it was determined that both ultrasound and EDT were sensitive in detecting CTS, with similar values for sensitivity and specificity between them.[22] The comparable values for these diagnostic procedures make them both likely options for use in patients with CTS who determine the need for surgical release. Their use may not exclude CTS but are helpful in the confirmation of the diagnosis. Ultrasound can be utilized concomitantly with injection treatments. In the absence of trauma, plain x-rays may not offer much assistance. CT scans may also be limited, other than being more sensitive for occult fractures, and may not sufficiently demonstrate soft tissue contribution as an etiology. The use of MRI without contrast may be useful and will be required if the treatment course includes surgery. However, sonography has fairly good accuracy in locating edema and other compressions of the median nerve.[23]

TREATMENT OPTIONS AND ORDER

Despite a wide variety of treatment options, there is no consensus on a CTS treatment that is universally accepted. Surgery is a common and effective treatment option for CTS, but other nonsurgical options are used, such as bracing, medications, stretching, physical therapy, osteopathic and other forms of manipulation, yoga, acupuncture, and herbals.

NON-SURGICAL APPROACHES

BRACING

Bracing may be used to immobilize the wrist of a CTS patient to relieve symptoms. The rationale for bracing is due to the observation that CTS symptoms tend to increase in severity with increased activity and improve after a period of inactivity. Symptoms may become more severe with activity due to increased carpal tunnel pressure associated with flexion and extension of the wrist. Thus, immobilizing the wrist in a neutral position can maximize space in the carpal tunnel and relieve some median nerve compression. Though some randomized controlled trials have shown that bracing alone is an effective CTS treatment,[24, 25] other studies have shown that splinting is not as effective as other treatment options such as surgery or is only effective in early phases of CTS.[26,27] Wrist splints may require adjustment to attain a custom-fitting to better facilitate proper positioning.

MEDICATIONS

Oral medications, such as nonsteroidal anti-inflammatory drugs (NSAIDs), are commonly used to treat CTS symptoms. Despite being widely used, NSAIDs have not been supported by any class 1 trial evidence for treating CTS but have been reported to improve symptoms in the short-term.[28] NSAID use may be discouraged or contraindicated in various conditions such as bleeding tendencies, liver damage, drug-drug interactions, pre-existing kidney or gastrointestinal (GI) injuries and diseases, and pregnancy. Acetaminophen may be the preferred drug for pain management in these specific cases but does not provide inflammatory improvement. Oral steroids may be used to treat CTS but similarly may only have short-term effects and should be used with caution in the presence of comorbid conditions such as diabetes mellitus.[29] It should be noted that narcotics are not indicated for pain management except in post-trauma patients. Local corticosteroid injections have shown to be more effective than oral medications but are also usually only effective in the short term. The injection site is typically on the wrist's anterior (volar) aspect, just adjacent to the median nerve. An ultrasound may be used to locate the injection site. A corticosteroid injection may include a mixture with one or more anesthetic agents (eg, lidocaine, bupivacaine) and is commonly performed by a specialist. Side effects may include nerve damage, joint infection or a temporary increase in blood sugar. It is speculated that the above medications mask the symptoms of CTS but do not resolve the pathology.[30]

STRETCHES/PHYSICAL THERAPY/OCCUPATIONAL THERAPY/YOGA

Yoga sessions that emphasize upper body stretching and relaxation techniques have been shown to improve short-term CTS symptoms. The effects of yoga may be partly due to the improvement of posture and exercise ability. However, yoga may not be an easily accessible option for many patients, as yoga studios can be expensive or not locally available. Given recent circumstances of the need to practice social distancing, there may not be the opportunity to be properly instructed in yoga practice. Physical therapy has also been a useful conservative treatment for CTS by having patient practice exercises for wrist mobility and strength. Physical therapists can also work with patients to develop more ergonomic postures and less likely to cause a CTS resurgence.[31] Modalities such as electric stimulation and therapeutic ultrasound may facilitate the reduction of edema and muscle contractions that contribute to the narrowing of the carpal tunnel space. Occupational therapy may be necessary in the rehabilitation of manual dexterity and strength as well, especially following surgery. Stretching is also a useful and easy treatment option for CTS patients, particularly myofascial self-stretching of the transverse carpal ligament. Self-stretching is also inexpensive and can be practiced independently at home by patients themselves.[32]

ACUPUNCTURE

Some patients may inquire about the efficacy of acupuncture, either traditional or laser acupuncture, to treat CTS. There are many types of acupuncture, and most involve the deliberate insertion of needles into specific points (acupoints) of the body. The theory is that the needles, either alone or with the addition of heat or electrical stimulation, may affect the body's life energy (qi, or chi). Some of the challenges of researching acupuncture are like the challenges inherent in researching osteopathic manipulative treatment (OMT). Each patient's treatment is typically individualized, making it difficult to have one specific treatment protocol. A recent Cochran review found that evidence is lacking to recommend the use of acupuncture for this condition, as many of the trials reviewed had small sample sizes and inconclusive results, especially for the long term.[33]

HERBAL THERAPIES AND SUPPLEMENTS

Patients may inquire about the use of supplements or phytochemicals, which they encounter when searching for "natural" remedies for CTS on the internet. Some websites recommend the use of vitamin B6, but that has not been shown to be of use in CTS patients who have no underlying deficiency. Many of the studies in the literature examining the use of different phytochemicals for CTS have inconclusive results or small sample sizes, and there are no herbal products that have been demonstrated to be efficacious or recommended with good evidence.[34]

SURGERY

Surgical decompression of the carpal tunnel should be pursued only when the patient has failed more conservative treatment measures. A surgical incision achieves decompression through the transverse carpal ligament. The risks of surgery include a

worsening of presenting symptoms; the possibility of needing a second surgery; persistent numbness; and complications from the procedure itself, including infection, scarring and loss of function. Pain along the incision site is the most commonly reported complication post-decompression.[35] The need for surgery is dependent upon the diagnostic factors and presenting symptoms and the patient's preference. The variability in development and progression of CTS makes it difficult to determine which patients will need surgery and which will only require more conservative methods for the resolution of symptoms. Traditionally, carpal tunnel release (CTR) was performed under general or intravenous (IV) anesthesia in an operating room, but many surgeons perform it as an outpatient procedure either in a surgical center or clinic.[36] During surgery, hydrodissection may be performed using ultrasound by injecting a mixture of corticosteroids and lidocaine between the transverse carpal ligament and the median nerve. This is done to break up adhesions and improve outcomes post-surgery, although the duration and usefulness of this procedure have not been fully explored.[37] CTR may be performed using a large palmar incision—a minimally invasive open technique—or endoscopic techniques. The formation of scar tissue has been proposed as a measure of success for patients undergoing CTR. Selection of technique should be based on the skill set, experience and preference of the surgeon performing the procedure. After CTR, the recovery period varies among patients and the procedure utilized, but patients may experience relief of symptoms as soon as a week, with a return to normal activities at 2 weeks.[19] Minimization of scar tissue and shorter incision lengths may lessen the risk of postoperative complications; the use of local anesthetic in minimally invasive procedures may also lessen risks by avoiding general anesthesia and the complications that may accompany it.[38] If the patient is hesitant about surgical decompression, a course of less invasive treatments may be prescribed beforehand to decrease symptoms and lessen the need for operative management.

PREOPERATIVE CONSIDERATIONS

Preoperative evaluations, including a physical examination performed by a primary care provider and clearance from other physicians, may be necessary for high-risk patients. Diabetic patients, patients with alcohol abuse disorders and elderly patients may experience less satisfactory outcomes due to surgical management, including recurrence of symptoms or dissatisfaction with outcomes.[39] Patients should be counseled about the risks of surgery before any procedure is performed. The percent of the reduction in numbness has been related to the patient's age and sex; in general, younger patients are more likely to have a greater reduction of symptoms than elderly patients.[39] However, the wide variability of CTR outcomes does not allow for the accurate prediction of symptom reduction in independent variables and should not be the guiding factor in determining whether a patient should undergo surgical management.

OTHER THERAPIES

Patients may ask about treatment with electrical stimulation, lasers or magnets. None of these has been proven to be effective in the treatment of CTS. Ergonomic evaluation and optimization may supplement other treatment modalities pursued by the patient and may decrease the likelihood of symptoms returning after treatment is completed.

OSTEOPATHIC MANIPULATIVE TREATMENT

Studies involving the efficacy of OMT are difficult to perform for a variety of reasons, including difficulty with performing blinded studies; the establishment of specific protocols, as OMT tends to be individualized; and patient preference to receive optimum treatment and to not be placed into randomized groupings. In addition, sham/placebo interventions may be too obvious, and, often, multiple other interventions have been attempted prior to and during courses of OMT. However, studies have been performed that demonstrated clinical, electrophysiological and radiological improvement following treatment.[40–42] Patients have even noted subjective improvement on the Boston Carpal Tunnel Syndrome Questionnaire, transverse carpal ligament length and a sensory symptom diagram that reaches statistical significance in the absence of electrodiagnostic and ultrasound evidence of improvement (eg, no cross-sectional area of the median nerve or transverse carpal ligament bowing).

In terms of the type of intervention and benefit/risk consideration, OMT falls on the spectrum alongside physical and occupational therapies, before injections and surgery. The goals of OMT are to reduce sympathetic input and spinal/rib restrictions though the upper thoracic, lower cervical and thoracic inlet regions; improve arthrodial mobility; reduce nerve compression as well as localized and regional edema; improve muscle and tendon contraction and dimensions; improve function; and reduce the patients' symptoms.[43,44] Treatment should address regions proximal and distal to the carpal tunnel as well.[45]

Treatment with OMT begins with a diagnosis of muscle strains, counterstrain tender points, fascial restriction reduction in passive and active ranges of motion, and specific arthrodial somatic dysfunctions (SD). Although noting asymmetry as one of the hallmarks of SD, bilateral CTS is fairly common and quality of reduction may be more important than quantity. It is also important to reassess the palpatory findings following treatment. The subjective response may be immediate or delayed.[43–53]

Counterstrain for pronator teres

- Clinical findings: tenderness at forearm distal to the popliteal crease; positive Durkan's test; positive Tinel's sign at pronator teres muscle; restriction in forearm supination, as the median nerve passes between the two muscular bellies of the pronator teres
- Monitoring: the physician monitors a tender point located over the pronator teres
- Patient position: seated or supine
- Physician position: standing or seated alongside the side of the finding

Method:

1. With the pad of 1 finger, the physician monitors the tender point throughout the whole procedure. Although the patient is to remain passive, they can note the level of tenderness at this point.
2. The patient's elbow is flexed to at least 90 degrees and pronated to an amount that significantly (greater than 70%) reduces the tenderness noted at the palpated tender point.
3. Flexion of the wrist can be added to shorten forearm flexors that share a common origin (medial epicondyle) with the pronator teres.
4. The position is held for 90 seconds or until tissue tension is noted to decrease.
5. The patient's arm is repositioned.
6. The tender point and regional restrictions are reassessed.

FIGURE 12:

Counterstrain for pronator teres

Muscle energy technique for a posterior radial head diagnosis

- Clinical findings: restriction in forearm supination and/or elbow extension; restriction of glide of the radial head on the capitulum; tenderness at the radial head (spasm of the pronator teres restricts supination)
- Monitoring: the physician monitors the radial head
- Patient position: seated or supine
- Physician position: standing or seated alongside the side of the finding

Method:

1. With the thumb and another finger, the physician grasps the radial head posteriorly and anteriorly.
2. The patient's elbow is extended and externally rotated to the physiological limit.
3. Extension of the wrist can be added as a means of lengthening forearm flexors that share a common origin (medial epicondyle) with the pronator teres, as well as shortening the forearm extensor muscles.
4. The patient is directed to supinate the forearm by flexing the elbow and turning the palm downwards for 3–5 seconds.
5. The physician provides isometric resistance throughout the patient's effort.
6. The patient is instructed to relax the effort for 3–5 seconds.
7. The patient's arm is repositioned to increase extension and supination, approaching the new barrier.
8. The procedure is repeated at least two additional times and is followed by new engagements of the barriers.
9. The range of motion of the regional restrictions and rotation of the radial head are reassessed.

FIGURE 13:

Radial head muscle energy technique

High-velocity low-amplitude (HVLA) for a posterior radial head diagnosis

- Clinical findings: restriction in forearm supination and/or elbow extension, restriction of glide of the radial head on the capitulum; tenderness at the radial head, as spasm of the pronator teres restricts supination
- Monitoring: the physician monitors the radial head
- Patient position: seated or supine
- Physician position: standing or seated alongside the side of the finding

Method:

1. With the thumb and another finger, the physician grasps the radial head posteriorly and anteriorly.
2. The patient's elbow is extended and externally rotated to the physiological limit.
3. Extension of the wrist can be added as a means of lengthening forearm flexors that share a common origin (medial epicondyle) with the pronator teres, as well as shortening the forearm extensor muscles.
4. The physician provides an anterior HVLA thrust of the radial head while simultaneously adding further supination and extension.

5. The patient's arm is repositioned to neutral.
6. The range of motion of the regional restrictions and rotation of the radial head are reassessed.

FIGURS 14:

Radial Head HVLA

Myofascial release of the wrist

- Clinical findings: restriction of wrist mobility, CTS symptoms and clinical findings
- Monitoring: the physician monitors the wrist with the fingers performing the maneuvers
- Patient position: seated or supine
- Physician position: standing or seated alongside the side of the finding

Method:

1. The patient's hand is parallel to the table or floor with the palm facing upward.
2. The physician places his 4th and 5th digits of one hand between the patient's 4th and 5th digits and the 4th and 5th digits of the other hand between the patient's 1st and 2nd digits. The physician's hands are relatively vertical with palms oriented toward each other.
3. Dorsiflexion/extension of the patient's wrist is introduced.
4. The physician's thumbs are placed on the lateral and medial attachments of the wrist flexor retinaculum (transverse carpal ligament).
5. Transverse distraction is applied to the flexor retinaculum by:
   a. Increasing the dorsiflexion by the physician lifting his 4th and 5th fingers;
   b. Separating the patient's 1st and 5th fingers laterally; and
   c. Utilizing the thumbs of both hands to introduce lateral stretching at both sides of the carpal tunnel.
6. This can be done as a single sustained effort while monitoring for a release of the soft tissue restriction or as a rhythmic, repetitive application.
7. If the dorsiflexion component exacerbates the patient's symptoms, this element can be skipped.
8. The dysfunction is reassessed.

FIGURE 15:

Myofascial release

Flexor retinaculum stretch

- Clinical findings: restriction of wrist mobility, CTS symptoms and clinical findings
- Monitoring: the physician monitors the wrist with the fingers performing the maneuvers
- Patient position: seated or supine
- Physician position: standing or seated alongside the side of the finding

Method:

1. The patient's hand is oriented parallel to the table or floor with the palm facing upward.
2. The physician places his hands and 2nd through 4th fingers on the patient's hand's underside/dorsum.
3. The physician's thumb pads are placed on the anterior wrist at the flexor retinaculum level at the center of the hand.
4. Dorsiflexion/extension of the patient's wrist is introduced.
5. The physician's thumbs are moved along the wrist in opposite directions laterally and medially toward the carpal attachments of the wrist flexor retinaculum (transverse carpal ligament).
6. Transverse distraction is repeatedly applied to the flexor retinaculum, utilizing both hands' thumbs to introduce lateral stretching at both sides of the carpal tunnel.
7. This can be done as a single sustained effort while monitoring for a release of the soft tissue restriction or, more commonly, as a rhythmic, repetitive application.
8. If the dorsiflexion component exacerbates the patient's symptoms, this element can be eliminated.
9. The dysfunction is reassessed.

FIGURE 16:

Flexor retinaculum spread

Counterstrain to the wrist

- Clinical findings: restriction of wrist mobility, CTS symptoms and clinical findings, tenderness of muscle tendon or ligament
- Monitoring: the physician monitors the wrist with the fingers performing the maneuvers
- Patient position: seated or supine
- Physician position: standing or seated alongside the side of the finding

Method:

1. With the pad of 1 finger, the physician monitors the tender point throughout the whole procedure. Although the patient is to remain passive, it is possible for them to note the level of tenderness at this point.
2. The patient's wrist is:
   a. Flexed if the tender point is on the ventral aspect;
   b. Extended if the tender point is on the dorsal surface;
   c. Deviated laterally if the tender point is on the radial side (extension or abduction of the thumb can facilitate positioning); or
   d. Directed medially if the tender point is on the ulnar region.
3. The position is adjusted to an amount that significantly (greater than 70%) reduces the tenderness noted at the palpated tender point.
4. Finger flexion, extension, abduction and/or adduction can be introduced to further modify the decrease in tension and tenderness.
5. The position is held for 90 seconds or until tissue tension is noted to decrease.
6. The patient's arm is repositioned.
7. The tender-point and regional restrictions are reassessed.

FIGURE 17:

Counterstrain wrist

Opponens roll technique

- Clinical findings: restriction of wrist mobility, CTS symptoms and clinical findings
- Monitoring: the physician monitors the wrist with the fingers and hands performing the maneuvers
- Patient position: seated or supine
- Physician position: standing or seated alongside the side of the finding

Method:

1. The physician grasps the patient's hypothenar region with one hand and the thenar thumb region with the other hand with the patient's hand's palm side upwards.
2. The physician then pulls the patient's thenar region laterally while simultaneously moving the thumb into extension to create traction.
3. The physician increases progressive stretch by further extending and abducting the opponens and abductor muscles.
4. This can be performed several times to increase the amount of stretch of the soft tissue.
5. The patient's hand is slowly released.
6. The regional restrictions are reassessed.

FIGURE 18:

Opponens roll

Carpal-carpal mobilization of the wrist

- Clinical findings: restriction of wrist mobility, CTS symptoms and clinical findings
- Monitoring: the physician monitors the wrist with the fingers and hands performing the maneuvers
- Patient position: seated or supine
- Physician position: standing or seated alongside the side of the finding

Method:

1. The physician places the palm of 1 hand against the dorsum of the patient's wrist and the palm of the other hand against the patient's ventral surface at the proximal carpal row, at approximately the distal wrist crease. The physician's hands are oriented perpendicular to the hand to be treated.
2. The physician then interlaces the fingers of both hands.
3. The physician introduces a mild compressive force with both hands.
4. The forces can be applied in such a manner as to be directed slightly offline and create flexion and extension at the carpo-radioulnar joints, the midcarpal joints and the carpo-metacarpal joints.
5. This is performed several times to create low-velocity, low-amplitude articulatory motions into the restricted joints.
6. The patient's hand is slowly released.
7. The regional restrictions are reassessed.

FIGURE 19:

Carpal-carpal mobilization of wrist

Lunate-carpal mobilization

- Clinical findings: restriction of wrist mobility, CTS symptoms and clinical findings, tenderness of muscle tendon or ligament
- Monitoring: the physician monitors the wrist with the fingers and hands performing the maneuvers
- Patient position: seated or supine (preferably)
- Physician position: standing or seated alongside the side of the finding

Method:

1. The physician places the thumbs of both hands overlapped against the dorsum of the patient's wrist at the proximal carpal row, at approximately the location of the lunate.
2. The physician's thenar and hypothenar eminences of both hands are wrapped around the wrists' medial and lateral edges.
3. The physician then interlaces the fingers of both hands over the anterior surface of the patient's wrist.
4. The physician introduces a mild compressive force with both hands, creating a bowing towards the center of the ventral wrist.
5. The patient is instructed to make a fist and flex at the wrist.
6. The physician further encourages the medial and lateral compression.
7. The patient is then instructed to extend the wrist while simultaneously opening the hand and abducting all fingers.
8. The physician introduces ventral glide of the lunate by pushing the overlapping thumb pads in a fulcrum-like fashion against the dorsum of the wrist.
9. This is performed several times to create low-velocity low-amplitude articulatory motions into the restricted joints.
10. The patient's hand is slowly released.
11. The regional restrictions are reassessed.

FIGURE 20A:

Lunate-carpal mobilization

FIGURE 20B:

Lunate-carpal mobilization

FIGURE 20C:

Lunate-carpal mobilization

FIGURE 20D:

Lunate-carpal mobilization

HVLA of the carpal joints

- Clinical findings: restriction of wrist mobility, CTS symptoms and clinical findings
- Monitoring: the physician monitors the wrist with the fingers and hands performing the maneuvers
- Patient position: seated or supine (preferably)
- Physician position: standing or seated alongside the side of the finding

Method:

1. The physician places the thumbs of both hands against the dorsum of the patient's wrist, bridging two adjacent carpal bones.
2. The physician's thenar and hypothenar eminences of both hands are wrapped around the medial and lateral edges of the 1st and 5th metacarpals and fingers.
3. The physician then interlaces the 2nd through 5th fingers of both hands firmly over the patient's palms' anterior surface.
4. The physician introduces a mild compressive force with both hands to spread the patient's metacarpals and carpals.
5. The physician introduces rapid articulatory ventral glide and separation of the restricted joint by creating a thrusting impulse that may be accompanied by wrist extension.
6. Other adjacent restricted joints can likewise be addressed.
7. The patient's hand is slowly released.
8. The regional restrictions are reassessed.

FIGURE 21:

HVLA initial

FIGURE 22:

HVLA final

SUMMARY

Carpal tunnel syndrome is the world's most common mononeuropathy, affecting a wide range of patients. Although various treatment options exist for CTS, there is no "one-size-fits-all" treatment plan upon which a physician can rely. By treating CTS in a stepwise fashion, beginning with more conservative measures before performing elective surgical decompression, physicians can tailor the treatment plan to the individual patient. Outcomes for therapies will vary depending on the patient's physiology, presentation, and personal preference. Physicians should approach the treatment and diagnosis of CTS as a team effort and work closely with the patient to form a therapeutic plan that will be most beneficial while encouraging increased treatment compliance. Encouraging questions, providing adequate education about available diagnosis and treatment options, having the patient participate in their treatment (eg, change in ergonomics, exercise, etc,) and giving guidance on which steps to take will contribute greatly to the positive outcomes of treatment.

AUTHOR DISCLOSURE(S)

No relevant financial affiliations or conflicts of interest. If the authors used any personal details or images of patients or research subjects, written permission or consent from the patient has been obtained. This work was not supported by any outside funding.

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REVIEW ARTICLE

INSOMNIA DIAGNOSIS AND MANAGEMENT: AN OSTEOPATHIC APPROACH

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KEYWORDS:

Insomnia

OMT

Osteopathic

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ABSTRACT:

Insomnia affects a large percentage of American adults and is among the most commonly treated medical conditions in the outpatient clinical setting. The psychological, medical and financial impact of insomnia is substantial. Research indicates that pharmacologic treatment is associated with significant risk, and clinicians should consider other modalities including cognitive behavioral therapy before prescribing medications for the treatment of insomnia. Other complementary treatments including yoga, stress management and traditional Chinese medical therapies are promising, but more research is needed.

The osteopathic family physician plays an important role in diagnosis and management. An osteopathic approach to patient care is highly beneficial and includes a multifaceted evaluation when taking a patient history and osteopathic manipulative treatment (OMT) to balance autonomic tone and correct associated somatic dysfunction.

INTRODUCTION

At any given time, up to 15% of all adults struggle with insomnia.[1] The osteopathic family physician encounters such patients in clinical practice on a regular basis, and the appropriate diagnosis and management of insomnia disorder has a significant impact not only on individuals and families but also on system-level occupational and medical costs. It is estimated that 30%–45% of American adults suffer from acute or chronic insomnia over the course of a lifetime,[1] resulting in $92.5 billion–$106.5 billion in annual medical costs.[2] Aside from medical costs, chronic lack of sleep results in significant physical and mental consequences from loss of occupational productivity and missed work.

Insomnia disorder is more common in women, with a bimodal age distribution during the younger adult years[3] and after menopause.[4] There is often a familial pattern and insomnia may have genetic influences, though this has not been fully determined.[1] Numerous associations have been attributed to insomnia including: older age,[2,5] female sex,[2,3,5] mental illness,[5] poor general health,[2,5] lower socioeconomic status,[3,5] family history,[2] easy arousability,[2] and chronic pain.[2]

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As osteopathic family physicians, we have the unique capacity to diagnose and manage insomnia from a whole-patient perspective. Given the numerous bidirectional associations between poor sleep quality and chronic medical and behavioral health issues, the evaluating physician must take into consideration all aspects of a patient's general health and socioeconomic disparities. Additionally, the evidence is clear that pharmacology alone is rarely the best option for the treatment of insomnia[2,4,5]; however, nonpharmacologic interventions such as behavioral health modalities and osteopathic manipulative treatment (OMT) may be beneficial components of a comprehensive sleep restoration plan.

Definition

The American Academy of Sleep Medicine defines insomnia as "the subjective perception of difficulty with sleep initiation, duration, consolidation, or quality that occurs despite adequate opportunity for sleep, and that results in some form of daytime impairment."[1,4] According to the DSM-5 criteria (Table 1), sleep difficulty should be present at least 3 nights per week for 3 consecutive months and should occur despite adequate opportunity to obtain sleep. Insomnia can be characterized as *acute* (symptoms lasting 1–3 months), *chronic* (symptoms lasting 3 months or longer), or *recurrent* (2 or more episodes within 1 year).[1,2,5]

It is important to note that the DSM-5 outlines new diagnostic terminology and replaces primary and secondary insomnia with insomnia disorder.[1] The terms "primary" and "secondary" are

no longer used considering recent research, which has shown that there is a bidirectional relationship between insomnia and associated physical or behavioral disorders.[6] For example, insomnia may occur as a result of underlying depression. Conversely, a patient who struggles with untreated or incompletely treated insomnia disorder may subsequently develop major depression. It is not necessary to determine temporal relationship or causality regarding medical or mental comorbid conditions. Rather, insomnia disorder should be identified as a separate clinical entity if it is severe enough to warrant treatment.[7] If the insomnia disorder occurs with another mental or medical comorbidity, it should be documented.[7]

Note that when coding for insomnia disorder, there is a singular code—G47.00—that encompasses all associated comorbidities. The comorbid diagnoses, if present, should be listed immediately after the insomnia disorder diagnosis to imply association. Medical complexity regarding coding does not escalate for insomnia disorder diagnoses (ie, Hierarchical Condition Category or HCC value) with the exception of insomnia related to substance use, which is beyond the focus of this paper.

TABLE 1:

Diagnostic and Statistical Manual of Mental Disorders (DSM-5) Diagnostic Criteria for Insomnia Disorder[7]

- Dissatisfaction with sleep quantity or quality with 1 or more of the following symptoms:
  - o Difficulty initiating sleep
  - o Difficulty maintaining sleep, characterized by frequent awakenings or trouble returning to sleep after awakenings
  - o Early-morning awakening with inability to return to sleep
  - o The sleep disturbance causes significant distress or impairment in daytime functioning, as evidenced by at least 3 of the following:
    - Fatigue or low energy
    - Daytime sleepiness
    - Impaired attention, concentration, or memory
    - Mood disturbance
    - Behavioral difficulty
    - Impaired occupational or academic function
    - Impaired interpersonal or social function
    - Negative effect on caregiver or family functioning
- The sleep difficulty occurs at least 3 nights per week, is present for at least 3 months, and occurs despite adequate opportunity for sleep.

Diagnosis

Insomnia disorder is a clinical diagnosis and is best identified after careful questioning of the patient, as well as a bed partner, if applicable. Historical questions should include timing of sleep, daytime effects, sleep schedule, sleep environment and sleep habits. It is also important to identify any contributing factors, including behavioral health diagnoses, comorbid medical conditions, medications and substance use.[2] Some clinicians recommend the use of a 2-week sleep diary before treatment, during treatment and after any relapse.[2] Wrist actigraphy may be a helpful adjunct and is a readily available tool for many patients, but it is not an alternative to a sleep diary.[1] Additionally, there are several validated sleep quality rating scales that may be used to gather subjective information regarding a patient's sleep habits and resulting level of impairment.[1] Commonly used tools include the Epworth Sleepiness Scale, the Pittsburgh Sleep Quality Index and the Insomnia Severity Index.

Determining the association of an underlying medical condition with insomnia disorder can be challenging. It is imperative that the workup of other medical conditions that may coincide with insomnia disorder remain focused only on those conditions suggested by the patient's history and physical exam. For example, laboratory evaluation may include complete blood count with iron studies if anemia is suspected. Likewise, patients who demonstrate signs and symptoms of hypothyroidism should be evaluated with a thyroid-stimulating hormone test and additional thyroid studies if indicated.[1] Other laboratory studies are generally not useful for the diagnosis of insomnia disorder.

Polysomnography (sleep study) is not required for the diagnosis of insomnia disorder but may be considered for patients who may have a sleep-related breathing or movement disorder.[1] Patients whose history and physical exam suggest obstructive sleep apnea (presence of hypertension, increased neck circumference, and snoring); narcolepsy; or sleep disturbances that are potentially self-injurious (parasomnias) should be referred for formal sleep studies.[8] Reserving polysomnography for only those patients with a high probability of a concomitant sleep disorder reduces unnecessary testing and added expense. Imaging is not of clinical value for the diagnosis of insomnia disorder.

Nonpharmacologic treatment

Many pharmacologic options have serious side effect profiles with little long-term proven benefit.[5] As a result, cognitive behavioral therapy for insomnia (CBT-I) is the recommended treatment approach. CBT-I includes stimulus control; sleep restriction; relaxation training; setting up an environment that promotes sleep (eg, temperature, lighting); education about sleep hygiene and daytime habits that may impair sleep (eg, napping, caffeine/nicotine use, screen time, diet, exercise, stress); and reframing cognitive distortions about sleep (see Table 2).[4,5,9] In general, treatment involves customized sessions over the course of 6 to 8 weeks.

When compared with pharmacologic therapy, CBT-I is safe and highly effective. Trauer *et al* presented a systematic review and meta-analysis in the *Annals of Internal Medicine* in 2015

that demonstrated clinically meaningful improvement in sleep onset latency, wake after sleep onset and sleep efficiency post-treatment with *P* values of 0.040, 0.026, and 0.017 respectively.[10] These results were maintained at early and late follow-up in study participants, which translates into a 6- to 18-month benefit for the patient after comprehensive CBT-I.[5,11,12] This is in comparison to Food and Drug Administration–approved medications, which are typically recommended for short-term use only, with a maximum advised time period of 4–5 weeks. For these reasons, many institutions recommend CBT-I as first-line for insomnia treatment; providers should emphasize to patients that this is the safest and most effective long-term treatment.[4,5,6,9,11,13,14,15]

TABLE 2:

Typical Components of CBT-I

Cognitive Therapy	Techniques aimed at identifying and altering dysfunctional beliefs and attitudes toward sleep and insomnia
Stimulus Control	Strengthening the association of bed and sleep and avoiding nonsleep activities in the bedroom
Sleep Restriction	Limiting time in bed to match perceived sleep duration, with a goal of >85% of time in bed to be asleep
Sleep Hygiene	Sleep schedule, environmental avoidances such as caffeine and nicotine, no screen time, no access to clock, normal sleep-wake cycles, dark environments at night, exposing pupils to daylight in the morning
Relaxation Techniques (RT)	Meditation, mindfulness, yoga, guided imagery, etc, with the goal to reduce muscular tension and facilitate sleep

As with any other behavioral intervention, this approach takes active patient participation and can be timely and expensive in nature; thus, it may be prohibitive for many patients. Perceived hardship of therapy and low patient effort commonly result in premature termination of treatment. Additionally, there are a limited number of qualified sleep medicine practitioners to address the widespread need for CBT-I.[6,12] Ideally, sleep therapists would be available in medical clinics, perhaps as a virtual medicine service, essentially offering an in-house ancillary option for patients. This has not yet been accepted or widely adopted.[6] It has also been noted that patients must utilize many components of CBT-I, not just one isolated component of therapy, for treatment to be optimized.[12,15] This brings the difficulty in therapy back to patient compliance, making readily available and easily accessible CBT-I providers a costly and somewhat nonproductive model.

Along with CBT-I, evidence supporting complementary and alternative medicine for treatment of insomnia is gaining traction. A few key complementary practices are available, including mind/body practice, stress management, yoga, multicomponent therapy, paradoxical intention,[2,12,16] and traditional Chinese medicine—which encompasses herbal therapy, acupuncture, auriculotherapy, psychotherapy, aromatherapy, music therapy, moxibustion, scraping and exercise therapy such as tai chi.[12,17,18,19] Further research is needed to fully understand the clinical utility of these complementary and alternative approaches to care.

Pharmacologic treatment

As with any disease process, underlying medical and behavioral causes of insomnia should be ruled out before considering pharmacologic intervention. Patients should be closely examined to determine if medical intervention is necessary, and in many cases it is advised that pharmacologic therapy be used as an adjunct only to CBT-I and other behavioral interventions.[13] As previously mentioned, 2 of the most common concomitant diagnoses to consider are obstructive sleep apnea and restless leg syndrome (RLS)/periodic limb movement disorder (PLMD), both of which can be discovered by polysomnography. Once it is established by the provider that pharmacotherapy may be beneficial, the following categories of medications may be considered: nonbenzodiazepines or "Z-drugs," orexin receptor antagonists, melatonin agonists, antidepressants, benzodiazepines (gamma-aminobutyric acid agonists), antipsychotics, antiepileptics and over-the-counter medications such as antihistamines.[4,5,9,13,20,21] The overarching concern in the literature points to unfavorable side effect profiles, especially of Z-drugs and benzodiazepines. This has brought into question the long-term effectiveness of these medications in comparison to their risk profile. There has been additional controversy regarding the use of these pharmacologic classes and increased mortality.[5,9] Notably, both categories have a high abuse potential.[4]

Outlined in Table 3 are the most common medication classes with specific medication names, mechanism of action, common side effect profile and relative benefit/specific population use.

TABLE 3:

Commonly Prescribed Medications

MEDICATION CLASS	MEDICATION NAME	MECHANISM OF ACTION	UNIQUE SIDE EFFECT PROFILE	RELATIVE BENEFIT/SPECIFIC INDICATIONS
Nonbenzodiazepines or "Z-drugs," Hypnotics	Zolpidem (Ambien) Zaleplon (Sonata) Eszopiclone (Lunesta)	Selectively binds to GABA receptors targeting the sedative effect rather than the anxiolytic effect	Memory loss Hallucinations Sleep walking, eating, driving Accidental injury Suicidal ideation ***Abuse potential***	Decreases sleep latency Improves total sleep time Improves sleep quality
Orexin Receptor Antagonists	Suvorexant (Belsomra)	Suppresses wakefulness through orexin receptor antagonism	Cataplexy Sleep paralysis Hallucinations Retrograde amnesia Suicidal ideation ***Abuse potential***	Decreases sleep latency Improves total sleep time
Melatonin Agonists	Melatonin Ramelteon (Rozerem)	Binds to melatonin receptors and works as agonist to them, inducing sleep	Dizziness Nausea Sleep behavioral disorder (rare)	Stabilizes sleep wake cycle Decreases sundowning Pediatrics and geriatrics
Antidepressants	Doxepin (Silenor)	Varies/Unknown	Sexual dysfunction Suicidal ideation	Limited evidence to prove benefit
Benzodiazepines	Estazolam Flurazepam Quazepam (Doral) Temazepam (Restoril) Triazolam	GABA receptor agonists	Distorts sleep architecture Accidental injury Retrograde amnesia ***Dependence and high abuse potential***	Improves sleep bruxism, but otherwise generally discouraged

Researchers have evaluated these medications to compare and contrast the effectiveness with other methods, such as sleep hygiene and CBT-I. Current recommendations from the Best Practices in Sleep Medicine: Choosing Wisely® campaign are noted in Table 4.

TABLE 4:

Best Practices in Sleep Medicine: Recommendations from the Choosing Wisely® Campaign, adapted from AAFP.org, December 2015[2]

RECOMMENDATION
Avoid use of hypnotics as primary therapy for chronic insomnia in adults; instead offer cognitive behavioral therapy and reserve medication for adjunct treatment when necessary. (American Academy of Sleep Medicine)
Do not use benzodiazepines or other sedative hypnotics in older adults as first choice for insomnia, agitation or delirium. (American Academy of Sleep Medicine)
Do not prescribe medication to treat childhood insomnia that usually arises from parent-child interactions and responds to behavioral intervention. (American Geriatrics Society)

Interestingly, the Agency for Healthcare Research and Quality recommends re-evaluating insomnia only 10 days after starting pharmacologic therapy. If at that point there is no improvement, it is advised to reconsider the therapy being provided. This is particularly interesting considering that the number of prescriptions for insomnia is over 20.8 million annually, per 2010 data.[4]

Osteopathic approach

Osteopathic family physicians share a core belief that each person is a unit composed of body, mind, and spirit. As such, the osteopathic physician should take a careful history in each of these areas to uncover all possible factors contributing to insomnia. In keeping with the recommendation that nonpharmacologic therapy is the best first-line approach for patients with insomnia, the osteopathic physician should encourage patients to optimize their own personal health in a way that promotes restorative sleep.

A thorough evaluation of the literature American Academy of Sleep Medicine presented no clinically validated studies regarding the use of OMT to treat insomnia disorder specifically. However, the authors propose that OMT directed toward normalizing parasympathetic and sympathetic tone would be of benefit for patients who struggle with insomnia disorder. Additionally, techniques targeted at underlying chronic medical disorders as well as any areas of chronic pain and somatic dysfunction may be of benefit. Cutler *et al* developed a small pilot study in 2005 that suggested cranial manipulation—specifically, the CV4 technique—can alter sleep latency, as can muscle sympathetic nerve activity.[22] Further research is needed to bolster these initial findings.

Though additional research is needed regarding the efficacy of OMT as an adjunct treatment for insomnia, basic osteopathic principles can be easily applied to promote comprehensive care of the patient who struggles with insomnia.

CONCLUSION

Insomnia is a common medical disorder that all osteopathic family medicine physicians will encounter on a regular basis; thus, an understanding of proper diagnosis and management is imperative. The osteopathic physician has the unique ability to treat the whole patient and incorporate OMT in the office, refer to behavioral health specialists for cognitive behavioral therapy, and utilize pharmacologic therapies when needed. Research has clearly shown that pharmacologic intervention should be initiated after cognitive behavioral therapy in light of well-known medication side effects from the vast majority of medications utilized to treat insomnia. Effective management of insomnia has the potential to improve patient quality of life, increase productivity in the workplace and at home, and save the health care system billions of dollars.

AUTHOR DISCLOSURE(S)

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REVIEW ARTICLE

AN OSTEOPATHIC APPROACH TO OCCIPITAL NEURALGIA AND TINNITUS

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KEYWORDS:

Occipital neuralgia

Tinnitus

ABSTRACT:

Eye pain and ringing in the ear are non-specific symptoms commonly evaluated by primary care physicians and specialists alike. The differential diagnosis for these symptoms is broad and includes musculoskeletal, ophthalmologic and neurologic considerations. Careful consideration of the differential diagnosis should include acute, potentially life-threatening pathologies such as glaucoma or intracranial masses, as well as common pathologies, including cervicalgia, headache variants (migraine, tension) and acoustic neuroma.

This report describes a patient with eye pain caused by occipital neuralgia and tinnitus. Correcting the somatic dysfunctions found in the head, cervical, thoracic and rib regions with osteopathic manipulative treatment resolved the occipital neuralgia and the tinnitus for this patient. Thus, osteopathic manipulative treatment should be considered for conservative management of occipital neuralgia and tinnitus.

INTRODUCTION

A 63-year-old female presented to the clinic with new sharp, stabbing, intermittent left eye pain that was non-radiating, had occurred every 2–3 days over the past 2 months and was rated 9/10 on the pain scale. She has a history of glaucoma and had seen her ophthalmologist 2 months prior, who determined that her eye pain was not secondary to glaucoma. Restasis eye drops, artificial tears and Tylenol did not improve her symptoms.

She had previously been treated with osteopathic manipulative treatment (OMT) 3 months before for right temporomandibular joint (TMJ) dysfunction, sphenobasilar symphysis (SBS) compression and right tinnitus. At current presentation, her cervicalgia had returned, with pain rated 9/10. The right ear tinnitus had restarted 3 weeks prior. She was not experiencing TMJ symptoms at this visit and denied any numbness, tingling or weakness of the extremities. Cervical magnetic resonance imaging (MRI) within the previous 3 months showed no nerve impingement or cord edema but did show a central disc osteophyte complex at C5–C6 with mild narrowing of the central canal. There was mild bilateral neural foraminal stenosis at this level. She had scattered areas of mild neural foraminal stenosis at multiple levels in the cervical spine. There was no report of any nerve impingement and there was no cord edema. Additionally, the patient's cervical MRI from 2018 revealed a normal impression of her brain with and without contrast.

Past Medical History:

- Chronic low back pain without sciatica
- Depression
- Fibromyalgia
- Gastroesophageal reflux disease without esophagitis
- Glaucoma
- Hypertension
- Obesity
- Tinnitus of right ear

Past Surgical History:

- Bilateral cataract surgery

The patient reported daily use of caffeine, no drug or alcohol use and no prior tobacco use.

The patient reported no known drug allergies.

Medications:

- Linaclotide: 72 mcg once daily
- Fluoxetine hydrochloride: 40 mg once daily

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- Lifitegrast ophthalmic solution 5%: .2 mL once daily
- Artificial tears ophthalmic solution 1%–0.3%: as directed
- Cetirizine hydrochloride: 10 mg as needed
- Pravastatin sodium: 40 mg once daily at bedtime
- Probiotic capsule: once daily
- Hydrochlorothiazide: 12.5 mg once daily
- Cyclosporine ophthalmic solution .05%: twice daily
- Voltaren gel: as needed

A review of systems revealed itching of the eyes, eye pain, neck pain, tinnitus, lower extremity edema and headache. Patient denied chest pain, shortness of breath, palpitations, changes in urination, fever, chills, night sweats, changes in weight, dizziness, numbness/tingling/radiation or weakness of the upper and lower extremities, or unsteady gait.

Physical Exam:

- Vitals:
  - o Height: 5'3" (160 cm)
  - o Weight: 194 lbs (88 kg)
  - o BMI: 34.4
  - o BP: 132/75
  - o T: 98.3°F (36.83°C)
- General: Alert, no acute distress
- Head: Normocephalic, atraumatic
- Eyes: Extraocular movements intact. Pupils round, equal and reactive to light. No scleral or conjunctival injection.
- Ears: Gross examination of the ears revealed normal-appearing pinna, and otoscopic exam revealed intact tympanic membranes bilaterally with good cones of light and normal-appearing middle ear architecture, no retraction or bulging of the tympanic membranes, and no visible fluid.
- Neck: Supple, without cervical lymphadenopathy
- Neurologic: Cranial nerves II–XII intact, deep tendon reflexes +2/4 upper and lower extremities bilaterally.

Osteopathic Structural Exam:

Muscle strength 5/5, upper extremities and lower extremities bilaterally. Occipitoatlantal (OA) joint was flexed, side bent right, rotated left. Frontonasal suture was restricted. Patient had a sphenobasilar synchondrosis compression of the head. Both temporal bones were restricted in motion. Suboccipital region had increased muscle tension.

Pressure applied over left greater occipital nerve at occiput reproduced left eye pain. Scalenes, sternocleidomastoid and upper trapezius were hypertonic bilaterally. There were lateral fascial strains to both eyes. C2 flexed, rotated, side bent right. T3 flexed, rotated, side bent right. T6 flexed, rotated and side bent left. There was inhalation dysfunction with right rib 1, as well as right ribs 3–5.

Diagnoses:

1. Occipital neuralgia
2. Cervicalgia
3. Tinnitus
4. Somatic dysfunction of the head, cervical, thoracic and rib regions

Patient treatment course

The following osteopathic manipulative treatments were applied:

Head: Soft tissue and Still technique to the OA. Cranial techniques were used in the following order: bilateral temporal bone release, frontal lift, frontonasal suture release, parietal lift, bilateral V-spread at the occipitomastoid suture and CV4. These techniques restored cranial motion and resolved the sphenobasilar synchondrosis compression. Myofascial release to treat bilateral fascial eyestrain is seen in Figure 1.

- Cervical: Soft tissue, balanced ligamentous tension, Still technique and muscle energy technique
- Thoracic: Soft tissue, articulatory technique and muscle energy technique
- Ribs: Soft tissue, articulatory technique and muscle energy technique

The patient reported immediate resolution of ocular pain, cervical pain and tinnitus after treatment.

Home instructions: Continue scalene and upper trapezius stretches from previous visits. Apply ice to suboccipital region twice a day for 10 minutes to relieve pain and inflammation.

Follow-up: At 1 month, the patient reported complete resolution of both right ear tinnitus and left eye pain. Her neck pain was improved with pain rated as 5/10. She reported that she had been stretching and icing as instructed.

FIGURE 1:
Myofascial periorbital release—fascial diagnosis. This can be an indirect or direct technique, performed bilaterally. Photo is not actual patient.

Discussion

The patient described above presented to her osteopathic manipulative medicine specialist with a chief complaint of left eye pain, neck pain and ringing in her right ear. These non-specific symptoms are commonly evaluated both by primary care physicians and other specialists. The differential diagnosis for these symptoms is broad and includes musculoskeletal, ophthalmologic and neurologic considerations. Initial evaluation of patients with similar eye pain, neck pain and ringing in the ear should include a detailed history and physical exam. Careful consideration of the differential diagnosis should include acute, potentially life-threatening pathologies, such as glaucoma or intracranial masses, as well as common pathologies, including cervicalgia, headache variants (migraine, tension) and acoustic neuroma.

OCCIPITAL NEURALGIA AND TINNITUS CLINICAL PRESENTATION

Occipital neuralgia is a cause of facial pain, with an incidence of 8.28% (30/362 cases).[1] Occipital neuralgia typically presents as head and neck pain that originates in the suboccipital region and radiates along the greater or lesser occipital nerve. The pain can be continuous, intermittent, shocking or shooting. A unilateral pattern of aching, burning and/or throbbing has also been described.[2] Although rare, occipital neuralgia can also include ocular pain, described by patients as pain behind the eye.[2] Pressure applied to the suboccipital region reproduces eye pain.[2] Relief from nerve blockage is both diagnostic and therapeutic.[2–4] Fujii and colleagues found the prevalence of tinnitus in a Japanese cohort between the ages of 45 and 79 years to be 11.9%,[5] while an earlier study by Levine and colleagues found that tinnitus was present in up to 80% of all adults.[6] Tinnitus is the "conscious, usually unwanted perception of sound that arises or seems to arise involuntarily in the ear of the affected individual."[7] There are many types of tinnitus, including otic (abnormal hearing, directly related to the ear), somatosensory (positional changes of head and neck improve tinnitus) and pulsatile (compression of vascular structures from tight jaw and neck muscles).[6,7] Ultimately, the uncomfortable ringing in the ears disrupts patients' lives and is a common chief complaint in the clinic.

OCCIPITAL NEURALGIA AND TINNITUS PATHOPHYSIOLOGY

The brain has an intrinsic motion that can be quantified and visualized with amplified MRI (aMRI).[8] Cranial bones move in response to changes in intracranial pressure volume, and total cranial compliance can be limited by cranial bone mobility at the cranial sutures.[9] The benefits of osteopathic cranial techniques depend on varying force applied to bones and sutures,[10] and cranial osteopathy has been shown to improve symptomatic tinnitus,[11,12] Bell's palsy[13] and residual pain from whiplash injury.[14] Restoring cranial bone motion supports inherent cerebral motion,[10] leading to improvement in symptomatic tinnitus.

The petrous portion of the temporal bone contains the exit of the Eustachian tube, and the petrous portion blends with the mastoid portion of the temporal bone.[11] The temporal bone forms the medial wall of the middle ear cavity and the external meatus.[11] The temporal bone also makes direct contact with the sphenoid anteriorly and superiorly, as well as the occiput posteriorly. The temporal bones affect other cranial bones during development,[15] and internal rotation of the temporal bones maintains partial or complete closure of the Eustachian tube.[16] Changes in orientation to the temporal bones can lead to tinnitus[16] and hearing loss.[17] Cobb and colleagues examined cranial bone changes of 9 achondroplasia patients, including "towering" petrous ridges, narrowed skull base and shortened carotid canals. Increased rotation of temporal bone structures, including the cochlea, out of the horizontal plane was determined to be the cause of their hearing loss.[17] Applied force to the zygoma can cause temporal bone restriction,[18] and this force can be from muscular compensation. Transient temporal bone restrictions include internal or external rotation of the temporal bones, contracted muscles altering the orientation of the zygoma and ultimately affecting the orientation of the temporal bones, and neighboring cranial strain patterns such as sphenobasilar synchondrosis compression. These somatic dysfunctions can be treated with OMT.

The greater occipital nerve (GON) is a key player in occipital neuralgia.[2,3] The GON originates from the C2 and C3 dorsal rami[19] and travels through both the semispinalis capitis muscle and the trapezius muscle, then the aponeurosis. The GON widens in diameter as it extends laterally, which could predispose the nerve to entrapment at the level of the occiput, leading to occipital neuralgia.[20] Still, there is evidence that the GON can be compressed at 6 different points.[21] Interestingly, there is a greater incidence of the GON piercing the cranial fascia that connects the trapezius muscle with the sternocleidomastoid (SCM) than of the GON proceeding through the trapezius muscle.[22] This could imply if the compression is closer to the cranium, localized pain in the suboccipital region would be more severe. Although compartment syndrome is an extreme example, when nerves are compressed such that the tissue pressure falls below adequate perfusion pressures, they are not adequately perfused, compromising function.[23]

Muscles and fascia can be responsible for entrapping peripheral nerves.[24,25] Hypertonicity of the trapezius and neighboring neck muscles can exacerbate occipital neuralgia. OMT targeted at these regions can decrease perception of pain, relax hypertonic muscles by decreasing alpha motor neuron activity, and inhibit an active muscle's contraction (by increasing tension on the Golgi organ complex).[26]

Moreover, the structure and function of the SCM and mastoid process of the temporal bone are interconnected.[27] Because the SCM attaches at the mastoid process of the temporal bone, a tight SCM can mechanically pull the mastoid process, influencing temporal bone rotation and ultimately leading to tinnitus.

The cranial techniques used to treat the tinnitus and occipital neuralgia included CV4, frontal lift, parietal lift, frontonasal suture release, bilateral temporal bone release and bilateral V spread

at the occipital mastoid suture. These techniques restore cranial motion and free restricted sutures.

The anatomical connections of the greater occipital nerve, neck muscles, back muscles, jaw and cranial bones suggest that OMT of the thoracic, rib, cervical and head regions may provide additional relief for patients experiencing occipital neuralgia and tinnitus.

OCCIPITAL NEURALGIA AND TINNITUS MANAGEMENT

Relief from nerve block is both diagnostic and therapeutic[2-4] for occipital neuralgia. Other interventions for refractory symptoms include medications, physical therapy, nerve stimulation, botulism toxin and surgery.[3,4] Unfortunately, these therapies can be invasive and time consuming for the patient. Additionally, tinnitus can be treated with lidocaine[28] or mindfulness-based techniques.[29] For this case, treatment of somatic dysfunctions with OMT improved the patient's neck pain, eye pain and ringing in her ear. Osteopathic family physicians should consider somatic dysfunction as a culprit to tinnitus and occipital neuralgia pain.

CONCLUSION

The patient in this case presented with history and physical exam consistent with the diagnoses of occipital neuralgia and tinnitus. The anatomical connections of the greater occipital nerve, neck muscles, back muscles and cranium suggest that OMT may provide relief for patients experiencing occipital neuralgia and tinnitus. OMT was effectively used in this case to resolve this patient's symptoms and improve her quality of life. Further research is needed on the efficacy of OMT treatments for auricular and ocular complaints.

AUTHOR DISCLOSURE(S)

No relevant financial affiliations or conflicts of interest. If the authors used any personal details or images of patients or research subjects, written permission or consent from the patient has been obtained. This work was not supported by any outside funding.

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BRIEF REPORT

IMPROVING DIAGNOSIS AND TREATMENT OF BENIGN PAROXYSMAL POSITIONAL VERTIGO

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KEYWORDS:

BPPV

Dix-Hallpike

Dizziness

Nystagmus

Vertigo

ABSTRACT:

Background: Vertigo is defined as an illusion of motion caused by a mismatch of information between the visual, vestibular and somatosensory systems. The most common diagnosis associated with whirling vertigo is benign paroxysmal positional vertigo (BPPV), which affects approximately 3.4% of patients older than 60 years of age.

Objective: This paper aims to educate primary care providers on how to diagnose BPPV by performing canalith repositioning maneuvers at the initial point of care. Timely treatment of BPPV in the primary care office is believed to reduce healthcare costs by way of limiting unnecessary diagnostic testing and lowering referrals for specialty care. Immediate treatment is also believed to improve the quality of healthcare delivery for the vertigo patient by reducing morbidity and resolving the condition without the need for referrals or imaging.

Population Health: A review of the literature finds that delayed diagnosis and treatment of BPPV is associated with a host of deleterious effects on patients. Population health impacts include increased rates of anxiety and depression; loss of work and/or change of career paths; inappropriate use of medications or emergency care resources; decreased access to healthcare services; increased healthcare costs; and reduced quality of care.

Diagnosis: A history of positional vertigo and evidence of nystagmus with Dix-Hallpike positioning confirms the diagnosis. A detailed description of the performance of this test is elucidated.

Treatment: The observed nystagmus is analyzed and classified based on directionality. Treatment can be initiated immediately with canalith repositioning maneuvers.

INTRODUCTION

Vertigo is an illusion of motion caused by a mismatch of information among the visual, vestibular and somatosensory systems. The most common cause of whirling vertigo is benign paroxysmal positional vertigo (BPPV), with a lifetime prevalence of 2.4%.[1] BPPV results from the displacement of calcium-carbonate crystals, called otoliths, from the otolithic membrane; they then drift into the lumen of a semicircular canal (Figure 1).[1,2] Subsequently, head movements result in shifting of the otoliths within the semicircular canal resulting in a sudden—and often violent—onset of whirling vertigo accompanied by nystagmus, which often subsides within 10–15 seconds following onset.

The treatment of BPPV was revolutionized in 1992 when John Epley, MD, made public his concept of canalith repositioning maneuvers (CRMs), which have been shown to resolve symptoms of BPPV, often on the first treatment.[2] Of interest, recent studies and trials have validated the effectiveness of treating BPPV by general practitioners trained in CRMs, or Epley maneuvers.[3] These new findings present an opportunity to improve population health by decreasing the health care costs associated with BPPV, improving the quality of treatment by avoiding common delays in care due to referrals or unnecessary diagnostic tests, and increasing public access to services. To achieve this, it is the position of the authors that BPPV should often be diagnosed and treated on initial presentation.

To that end, we provide a method of diagnosing and treating BPPV and encourage its use by primary care physicians, emergency

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medicine physicians and midlevel providers who encounter this problem frequently. We begin with a discussion on the population health implications of BPPV with respect to the cost of, access to and quality of care.

POPULATION HEALTH: COST, ACCESS AND QUALITY

The prevalence of BPPV as a diagnosis in the primary care setting has increased in recent years, likely due to increased awareness, increased accuracy in diagnosis and the growing elderly population.[3] Despite the rise in screening and diagnosis by general practitioners, evidence suggests there is a need to improve adherence to the recommended guidelines in this setting.[3,4] As few as 10%–20% of patients are being treated with CRM techniques during the initial visit for BPPV.[1] It is often months or years before the diagnosis is made. The reason for this is likely multifactorial and merits further study.

One recent study surveyed 50 practicing emergency medicine physicians on their use of CRMs for dizzy patients. Some of the reported reasons for not performing CRMs include prior experiences of patient intolerability and forgetting how to correctly perform the technique.[5] During this delay, patients experience deleterious effects on their quality of life. Sixty-seven percent of patients report feeling depressed due to their condition, 86% suffer interrupted daily activities and lost days at work, 68% reduce their workload, 4% change their job, and 6% quit their job because of the disabling effects of BPPV.[4,6] In addition to the lost or reduced income, patients also accumulate unnecessary and often extensive medical costs before diagnosis and treatment. One study found that 70% of BPPV patients managed in the primary care setting undergo magnetic resonance imaging studies and 45% have computed tomography scans.[7]

The same study reported that 53% of vertigo patients received medication for BPPV. While medications that suppress the vestibular system may provide some temporary relief, they are not recommended, as they are likely to further delay more effective treatment.[8] These unnecessary studies and medications lead to increased hospital admissions and expenses for patients. The need to reduce hospitalizations for manageable conditions, such as BPPV, is greater now than ever. When delayed, a diagnosis of BPPV costs a patient an estimated $2000. The overall health care cost per year for the diagnosis of BPPV is $2 billion.[7,8] As the nation's population continues to age, these costs are projected to increase.

Over 50% of patients complaining of dizziness are seen by primary care physicians, compared to 13.3% seen by otolaryngologists.[8] We recommend that primary care providers implement point-of-care CRM techniques, thus providing optimal care while avoiding unnecessary costs and delays in treatment.[8]

DIAGNOSIS

Dizziness is a term commonly used by patients and providers, describing a sensation of spatial disorientation. A thorough history starts with asking the patient to further characterize their balance disorder. Generally, a patient complaining of fainting or feeling as if they are going to "pass out" suggests a cardiovascular or central nervous system etiology. Alternatively, a sensation of room spinning implies vertigo, which suggests a vestibular etiology. History involves the onset, duration, severity and eliciting factors. Patient symptoms are often described as recurrent and brief, and sudden episodes of whirling vertigo related to positional changes (eg, turning over in bed) are often associated with nausea and vomiting.[8] The initial evaluation of a patient complaining of whirling vertigo requires an ear exam, a tuning-fork test and possibly an audiogram. If warranted, a neurological exam should test cranial nerves, coordination, gait and balance to consider the central causes of vertigo. In some cases, the carotid arteries should be auscultated for bruits, as carotid artery stenosis can cause near-syncopal episodes mimicking vertigo. A thorough review of current medications should be performed to rule out potential side effects of therapeutic agents. The most encountered medications causing dizziness and disequilibrium include certain antipsychotics, antihypertensives, sedatives and ototoxic medications.[7,8] Dix-Hallpike positioning, accompanied by a history of positional vertigo, may directly lead to canalith repositioning and preclude the need for in-depth analysis of central, neurologic, vascular and pharmacological causes of dizziness.

The diagnosis of posterior semicircular canalithiasis BPPV—the most common form of BPPV—is made based on a history of recurrent sudden-onset positional vertigo and evidence of rotary nystagmus elicited by the Dix-Hallpike test (or Dix-Hallpike maneuver) with the affected ear down. Rarely, the condition may be present bilaterally. To perform the Dix-Hallpike test[8,9] (Table 1), have the patient begin in the seated position (Figure 2). Have the patient turn their head 45 degrees toward the ear being evaluated. Next, assist the patient in assuming the supine position with their head extended 20 degrees from the horizontal plane, unless contraindicated (Figure 3). Contraindications include cervical spine immobility, vascular insufficiency and intolerability of other neck extension.[10] Canalith movement and associated nystagmus may still be elicited without extension of the neck due to steepening of the slope of the semicircular canal in the supine position. Lastly, instruct the patient to keep the eyes fixed and open, allowing for observation of nystagmus. If nystagmus does not occur, proceed with testing of the other ear by turning the head 90 degrees toward the opposite side. The observed nystagmus is typically described as having a latency period of 10–15 seconds, reaching its peak and then disappearing within 10–20 seconds for rotary and often longer for horizontal nystagmus.[11]

Key clinical features distinguishing peripheral from central vertigo include the sudden onset of positionally induced severe whirling vertigo of short duration.[8] The nystagmus is fatigable.

Although rotary nystagmus is typically observed due to the high prevalence of posterior semicircular canalithiasis (85%), horizontal nystagmus may be observed in the case of horizontal semicircular canalithiasis. Superior semicircular canalithiasis is seldom identified.[2] In some cases, with positive history, the Dix-Hallpike maneuver fails to elicit any form of nystagmus, and it may be detected at another visit.

TREATMENT

The Epley maneuver is one of the most effective canalith repositioning procedures and is considered the gold standard for treatment of posterior semicircular canalithiasis. According to one study, 80% of cases of posterior canal BPPV were asymptomatic after one treatment and 92% were asymptomatic after multiple treatments. Less than 1% of cases showed no response to treatment.[12,13] Treatment of posterior canal BPPV can be initiated immediately upon diagnosis (Table 2). Head position 1 corresponds with the position of the patient during the Dix-Hallpike maneuver, which may result in the generation of vertigo and associated nystagmus (Figure 3). Position 2 is obtained by rotating the head 90 degrees toward the opposite side, away from the initial position, and monitoring for 30–60 seconds (Figure 4). This allows time for the dislodged otoliths to float through the posterior canal, and if that happens a new sensation of whirling vertigo will occur. Successful treatment requires ample time, 20–30 seconds, for particle repositioning. Another 90-degree rotation of the head will require the patient to move onto their shoulder in the lateral recumbent posture (Figure 5). Position 3 is commonly the position for a second bout of whirling vertigo to manifest, suggesting that the posterior semicircular canal has been cleared (Figure 6). In the lateral recumbent posture, if no nystagmus is elicited, the head can be rotated between positions 2 and 3 several times attempting to clear the canal. The patient is then assisted to a seated position with the head slightly inclined to complete the treatment.

Repeat Dix-Hallpike testing is then performed to confirm resolution of BPPV. Optimal results are likely when the patient does not demonstrate nystagmus upon repeat Dix-Hallpike positioning 2 or 3 times.[2] If rotary nystagmus is again identified, CRMs may be repeated until symptoms and nystagmus have resolved if the patient can tolerate additional positioning at the current visit. Treatment can be stopped if patient comfort is compromised.

Occasionally, a canal switch occurs during treatment of posterior canal BPPV. As otoliths exit the posterior canal, they fall into the horizontal canal. Horizontal canalithiasis is recognized by the development of violent horizontal nystagmus on Dix-Hallpike recumbent positioning with the head rotated to the right or left. It does not fatigue as quickly as rotary nystagmus. The dependent ear closest to the examination table or bed is responsible for the abnormal inner ear stimulation and resultant vertigo. Treatment consists of 4 90-degree turns of the head away from the initial position, resulting in a complete 360-degree "log roll" of the patient. The intensity of vertigo often reduces with the next 90-degree turn of the head. This may be noted in two or more positions, but turning through 360 degrees is the typical treatment (Table 3).

Current guidelines strongly recommend against postprocedural postural restrictions for posterior canal BPPV.[8] With instructions, the patient may repeat the CRMs at home. Reasons a patient may need to treat themselves at home may include recurrence of symptoms, patient discomfort during CRMs before resolution of BPPV is achieved or strong clinical suspicion of BPPV without positive nystagmus seen in clinic. Follow up within 1–2 weeks if symptoms persist, as residual symptoms are common during this period.[8] A virtual visit could be implemented as a follow-up, especially if patient education has already been provided in-office and the patient has someone to assist them at home.

TABLE 1:

Steps of the Dix-Hallpike Maneuver[8]

Start with patient in seated position.
Rotate patient's head 45 degrees toward suspected ear.
Assist patient in assuming the supine posture, maintaining head rotation.
Instruct patient to keep the eyes open, allowing observation of nystagmus.
Repeat test on the other side for comparison.

TABLE 2:

Epley Maneuver for Canalith Repositioning of Posterior Canalithiasis[7]

Left Ear		Right Ear
	*Position 1: The patient is assisted in assuming the supine posture while the head is rotated 45 degrees toward the affected ear (the position corresponding to a positive Dix-Hallpike maneuver).*	
	*Position 2: The patient's head is rotated 90 degrees away from position 1, toward the opposite side. The patient's eyes are monitored for 30–60 seconds for evidence of nystagmus indicating canalith repositioning.*	
	*Position 3: The patient is assisted in assuming a lateral recumbent posture and the patient's head is rotated further by another 90 degrees. The patient's eyes are monitored for 30–60 seconds for evidence of nystagmus indicating canalith repositioning and held for an additional 20–30 seconds for repositioning to complete. The patient is then assisted to a seated position with the head slightly inclined briefly before repeating Dix-Hallpike testing to confirm resolution.*	

TABLE 3:

360 Degree "Log Roll" Canalith Repositioning of Horizontal Canalithiasis[7]

Left Ear		Right Ear
	*Position 1: The patient is assisted in assuming the supine posture while the head is rotated 45 degrees toward the affected ear.*	
	*Position 2: The patient's head is rotated 90 degrees away from position 1, toward the opposite side. The patient's eyes are monitored for 30–60 seconds for evidence of nystagmus.*	
	*Position 3: The patient is assisted in assuming the prone posture and the patient's head is rotated further by another 90 degrees and held for 30-60 seconds for evidence of vertiginous symptoms.*	
	*Position 4: The patient's head is rotated further by another 90 degrees and held for 30–60 seconds for evidence of vertiginous symptoms and held for an additional 20–30 seconds for repositioning to complete.*	
	*Position 5: The patient is assisted in returning to the starting position (a full 360 degrees of rotation) to complete the treatment. Then, repeat Dix-Hallpike testing is performed to confirm resolution of horizontal nystagmus and vertiginous symptoms.*	

FIGURE 1:

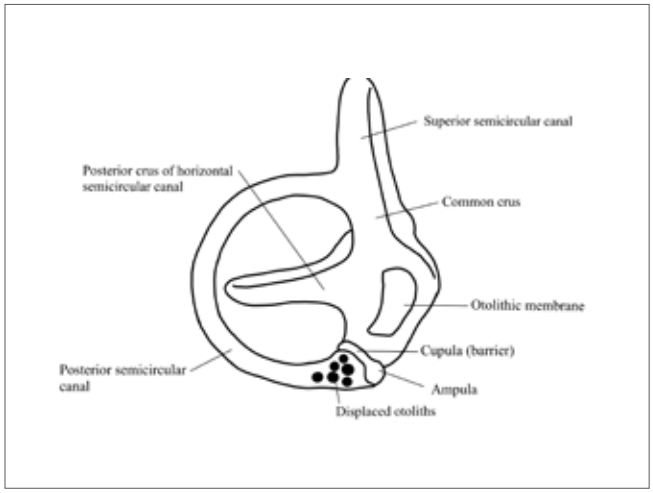


FIGURE 2:

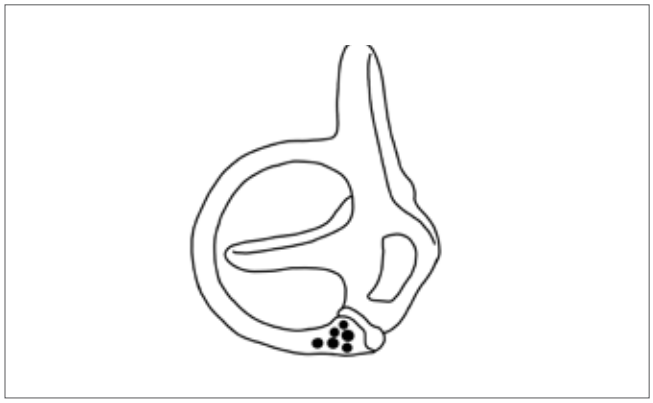


FIGURE 3:

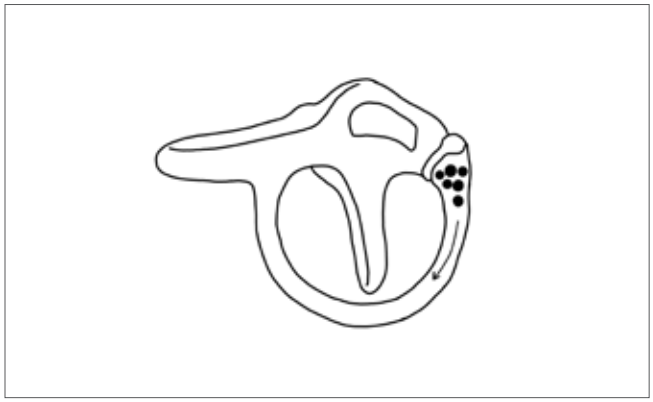


FIGURE 4:

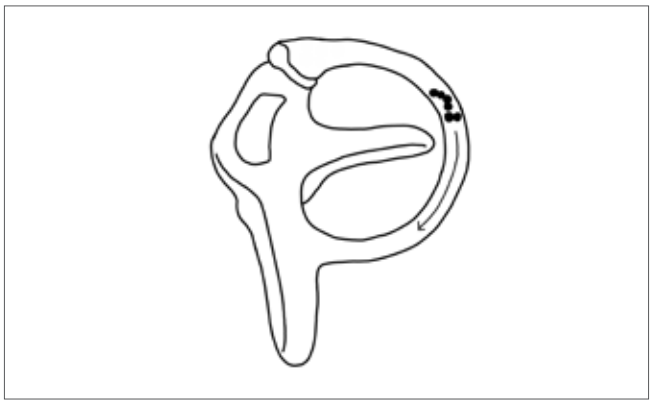


FIGURE 5:

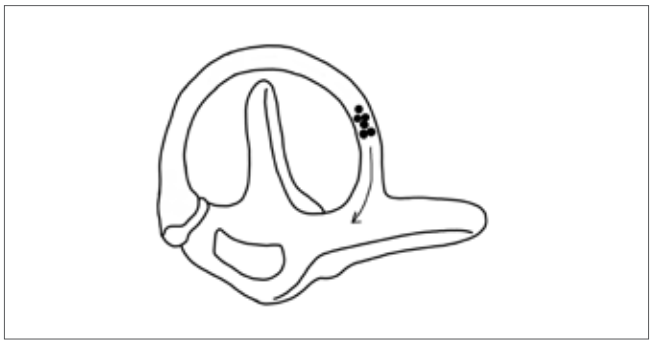
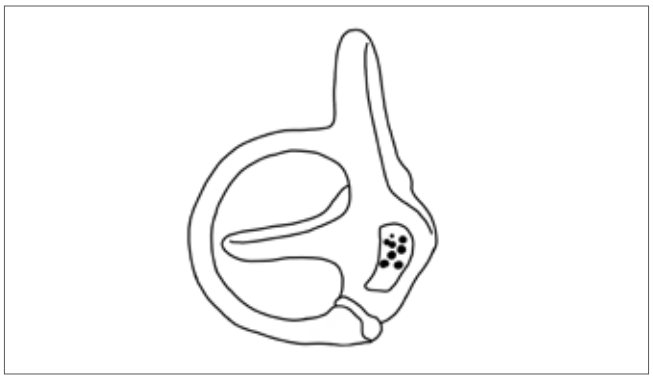


FIGURE 6:



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CLINICAL IMAGE

ENLARGING PAINFUL TUMOR ON FINGER WEBSPACE

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KEYWORDS:

Friable

Mass

Painful tumor

A 72-year-old male with a past medical history of diabetes mellitus type 2, atrial fibrillation, heart failure, hypertension and coronary artery disease presents to the outpatient clinic with a painful growth on his right hand for the past 3 months. He went to the ER for evaluation 1 month ago. The patient notes that the lesion had grown and caused swelling and pain. The base would slowly bleed if manipulated. The patient did not recall any injury or trauma; however, he often has small nicks and injuries without realizing it.

Examination revealed an irregular erythematous friable 2 cm x 3 cm tumor along the webbing between the fourth and fifth digits of the right hand with minimal yellow discharge and scaling at the base.

FIGURE 1:

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FIGURE 2:

QUESTIONS:

1. Which of the following is the most likely diagnosis?

A. Amelanotic melanoma

B. Bacillary angiomatosis

C. Orf zoonotic infection

D. Pyogenic granuloma

2. Mucosal lesions of the above diagnosis are most common in which age group?

A. Adult men

B. Adult women

C. Children

D. Pregnant women

3. What histological findings are most expected with the above diagnosis?

A. Polymorphic arrangement of vessels

B. Lobular capillaries with prominent endothelial cells with neutrophils and lymphocytes

C. Intraepidermal vesiculation, eosinophilic inclusions, and papillary dermal edema

D. Proliferating capillaries in a lobular arrangement lined by bland endothelial cells

4. Which of the following is the best treatment option for this patient?

A. Cryotherapy

B. Excision and electrodessication

C. Intralesional steroids

D. Topical timolol

ANSWERS:

Which of the following is the most likely diagnosis?

Correct Answer:
D. Pyogenic granuloma

Given the history of growth and bleeding, this is a classic case of pyogenic granuloma. Diagnosis is generally clinical, with report of rapid growth of an erythematous vascular lesion with occasional mention of previous trauma to the area.[1] Amelanotic melanoma should always be considered in the differential, and a biopsy needs to be obtained to rule it out.

Bacillary angiomatosis is caused by *Bartonella henselae*, typically from a patient being exposed to a cat bite. This is more commonly seen with immunocompromised or HIV/AIDS patients. Clinical presentation is similar to pyogenic granuloma; however, there is usually a history of a cat bite.

Orf zoonotic infection can also look similar to pyogenic granuloma, but there is an exposure to sheep or goats.

Mucosal lesions of the above diagnosis are most common in which age group?

Correct Answer:
A. Adult women

Pyogenic granulomas occur in all age groups. Mucosal pyogenic granulomas are more common in adult women than men, at an incidence rate of 2.6:1. It is noted that cutaneous pyogenic granulomas, as is the presentation in this case, are more common in male patients as compared to female patients, at an incidence rate of 1.2:1.[2] They are relatively common in children. Intraoral pyogenic granulomas can occur in the first months of pregnancy.

What histological findings are most expected with the above diagnosis?

Correct Answer:
D. Proliferating capillaries in a lobular arrangement lined by bland endothelial cells

Pyogenic granulomas often have the typical findings of a lobular arrangement of proliferating capillaries representing epithelial collarette. A histological difference between this and bacillary angiomatosis is the finding of bland endothelial cells in pyogenic granulomas as opposed to the expected finding of multiple neutrophils, lymphocytes, and possible histiocytes in the latter.[1,3,4,5] While amelanotic melanoma is a great masquerader, the vessel arrangements are often more polymorphic in nature.[6] Intraepidermal vesiculation and eosinophilic inclusions are more commonly seen in Orf zoonotic infections.[7]

Which of the following is the best treatment option for this patient?

Correct Answer:
B. Excision and electrodessication

Cryotherapy would be reasonable for lesions smaller than 1 cm; however, recurrence is common. Given the large size of the lesion in our patient, cryotherapy is not the best option.

Shave excision with curettage and electrodessication of the base is the preferred treatment for larger lesions. Excision provides a histologic diagnosis, and electrodessication of the base controls bleeding and prevents recurrence.

Intralesional steroids are an option for therapy, but they require frequent treatments and recurrence is high.

Topical timolol is an option for smaller multiple lesions or use in pediatric patients, but it also has a high recurrence rate.[8,9]

DISCUSSION:

Pyogenic granuloma, also known as lobular capillary hemangioma, is a common benign vascular tumor.[10] This is a cutaneous or mucosal growth that typically has a friable surface and is further characterized by rapid growth.[4] It can occur at any age but is more often seen in children and young adults.[11] Peak incidence is typically within the second or third decade of life. Pyogenic granuloma during pregnancy is common.[12] Mucosal pyogenic granulomas are most common in adult females.

The exact cause of pyogenic granuloma is unknown, although traumatic injury has been theorized as a trigger.[13] Another theory involves drug-induced pyogenic granuloma. Possible offending pharmacologics include oral contraceptives, systemic retinoids, epidermal growth factor receptor inhibitors, topical fluorouracil, cyclosporine, tacrolimus, and HIV protease inhibitors.[14,15] Formation of pyogenic granulomas during pregnancy has also been theorized to be secondary to hormone changes.[10] Congenital variants of pyogenic granuloma are exceptionally rare and difficult to distinguish from infantile hemangiomas without histologic examination.

Pyogenic granulomas start off as small red papules that rapidly grow. The initial vascular appearance is due to the underlying capillaries being more prominent. This can lead to more bleeding in developing pyogenic granulomas.[12] In children, it is most common on the head and neck, whereas in adults, it is more commonly seen on the trunk and extremities.[8] The size can range from a few millimeters to a few centimeters. Diagnosis of pyogenic granuloma is clinical based on history and physical examination. It is important to biopsy all pyogenic granulomas to rule out amelanotic melanoma.[13]

These tumors do not have potential for malignancy. However, spontaneous resolution of pyogenic granulomas is rare, with patients reporting frequent profuse bleeding episodes, ulcerations, and secondary infections.[15] Surgical treatment is often necessary. Shave excision followed by curettage and electrodessication may be used in cosmetic areas; however, there remains a risk of reoccurrence. Complete primary surgical excision is generally recommended in less cosmetic areas.[15] Surgical excision has the lowest recurrence rate but a high incidence of scar formation.[13] Cryotherapy has a low recurrence but requires multiple treatments and has risk of scar formation. Topical timolol is useful for multiple smaller lesions in pediatric patients but has a high recurrence rate.[8,9]

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PATIENT EDUCATION HANDOUT

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Low-Back Pain in Adolescents

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Low-back pain is a common reason for some children and adolescents to see their doctor. The risk for low-back pain increases with increasing age, puberty and growth. At least 7% of 12-year-olds have had at least 1 episode of low-back pain. By age 20, the lifetime prevalence of low-back pain has been reported as high as 80%. Having low-back pain as a teenager is predictive of having low-back pain as an adult.

Most back pain in adolescents is benign and usually caused by musculoskeletal conditions, such as strains or sprains. Some adolescents have had an injury or have serious underlying medical conditions that cause their low-back pain. Eighty percent of adolescent low-back pain does not have a specific cause and may be due to many different things.

Risk factors for having low-back pain include a family history of low-back pain, a previous back injury, time spent sitting, obesity, sports participation and female gender. Teenagers who do not participate in any physical activity are more likely to have low-back pain compared to teenagers who are more active. However, those who are very active in sports, especially very competitive sports, are more likely than sedentary individuals to have low-back pain. A lot of parents worry that a heavy backpack will cause low-back pain, but several studies have concluded that this is not true.

Your doctor should perform a comprehensive history and physical on your teenager during their visit. They should also look for warning signs that the low-back pain may be due to something more serious. Pain that wakens your child from sleep, pain that is sudden, pain that lasts longer than four weeks, fever, weight loss, tenderness over the spine, or any abnormal neurological findings like numbness or tingling need medical attention right away.

There are many ways to help your child or teenager if they are having low-back pain. It is important to let your child rest and avoid activities that make their low-back pain worse. Applying ice in the first 24 hours can help them feel better, after which a heating pad will help. Using over-the-counter medicines, like ibuprofen, can help with their pain and muscle inflammation. Their doctor may also refer them to physical therapy if the back pain is due to muscle weakness. Physical therapy focuses on increasing muscle strength and flexibility. Osteopathic manipulative treatment has also been shown to improve muscle function and movement in this population.

SOURCE(S):

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Prevention of Otitis Media

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WHAT IS OTITIS MEDIA?

Otitis media (commonly called an ear infection) is the most common reason children receive antibiotics. When your child gets seasonal allergies or a cold, fluid can build up behind the eardrum, causing pain and muffled hearing. This fluid can also get infected by bacteria, causing fever and chills.

The most common symptoms of otitis media are ear pain or pressure, trouble hearing, and fever. Symptoms in younger children can include pulling at ears, vomiting and general fussiness. These symptoms can last weeks or even months.

HOW IS OTITIS MEDIA TREATED?

If you notice your child experiencing these symptoms, take them to a doctor to have their ears checked. After talking to you and your child, the doctor may use an otoscope—a light used to see inside the ear—to examine your child's eardrum. They may tell you that the eardrum is "bulging," indicating that there may be fluid pressing on it.

Since ear infections can go away on their own, your doctor may wait a few days before giving your child antibiotics. However, if your child is younger than 2 years old, or if they're very sick, your doctor may start antibiotics right away. Symptoms usually resolve in about 1 week.

HOW CAN I KEEP MY CHILD FROM GETTING OTITIS MEDIA?

If your child gets ear infections frequently, you can talk to the doctor about certain steps you can take to help your child stay well. These include:

- Keeping your child up to date on vaccines, including their yearly flu shot
- Ensuring your child is not exposed to secondhand smoke
- Giving your child a daily antihistamine or daily antibiotic during the season in which they experience allergies or colds
- Having your child undergo surgery to place a small temporary tube—called a tympanostomy tube—in their ear, which prevents fluid from collecting in the ear

SOURCE: Pelton SI. Acute otitis media in children: treatment. Uptodate.com. Updated January 15, 2019. https://www.uptodate.com/contents/acute-otitis-media-in-children-treatment

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