REVIEW ARTICLE

An Osteopathic Approach to the Treatment of Ovarian Cancer

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Ovarian cancer remains a highly lethal and prevalent disease in the United States currently being the fifth leading cause of cancer-related death for women for the year of 2014. Despite advances in surgical and medical management, this disease usually carries a poor prognosis. Current guidelines to the management and treatment of ovarian cancer outlined by the National Comprehensive Cancer Network (NCCN) are utilized by both osteopathic and allopathic physicians to improve the outcome of this disease in their patients, but there has yet to be an integration of the NCCN recommendations and core osteopathic principles. The osteopathic approach to ovarian cancer (OstOCA) described in this paper addresses the treatment and management of ovarian cancer by synthesizing the NCCN's recommendations and the key principles, evidence-based manipulation techniques, and philosophy of osteopathic medicine. This novel approach holds promise to improve both diagnosis and treatment ovarian cancer and potentially improve outcomes for patients with this disease. Future studies designed to properly test this model in its intended population are the next step into defining a role for osteopathic concepts in the treatment and management of ovarian cancer. Such a study, should it demonstrate benefit, would also open the door for new proposals of protocols for osteopathic management of other neoplastic processes and provide a new frontier for osteopathic medicine and research.

INTRODUCTION

The constellation of human malignancies collectively referred to as "ovarian cancer" remains highly prevalent and lethal in the American population despite major advances in our molecular and biological understanding of the disease, along with improved treatment modalities. Ovarian cancer currently is the fifth leading cause of cancer-related deaths among American women with an estimated 21,980 new cases and 14,270 estimated deaths nationwide in 2014.[1] Because symptoms associated with the disease are typically nonspecific and often silent before reaching an advanced stage, more than two-thirds of cases of ovarian cancer are only diagnosed when the disease has progressed to stage III or IV and involves the peritoneal cavity or other organs.[2] Such stages confer a much poorer prognosis as compared with stage I disease: When ovarian cancer is detected and treated while still at stage I, where the malignancy is confined to the ovary, the five-year survival rate approaches 90% whereas when it is detected at the far more common stage III or IV, the rate drops to around 33%, even when the most aggressive and advanced therapies are employed.[3] Due to the lack of a consistent and reliable screening methodology for this disease, stage I disease is often missed and ovarian cancer treatment remains a challenge for the medical community.

Current guidelines for the management of ovarian cancer, specifically in the scope of epithelial ovarian cancer, fallopian tube cancer and primary peritoneal cancer, are outlined by the National Comprehensive Cancer Network (NCCN).[4] Although these guidelines are used by osteopathic physicians in the field, there has yet to be an integration of the NCCN's recommendations and core osteopathic principles of practice. The following osteopathic approach to ovarian cancer (OstOCA) would serve to enhance treatment and management of ovarian cancer by synthesizing the NCCN's recommendations and key principles, evidence-based manipulation techniques, and philosophy of osteopathic medicine. The addition of these components would make critical improvements to the areas of diagnosis and treatment that current strategies insufficiently address, namely, early detection, response to treatment, and long-term recovery. By addressing these difficulties that currently mar the successful treatment of this disease, the OstOCA holds promise to potentially improve patient outcomes and make ovarian cancer a more manageable and treatable disease.

THE OSTOCA'S OSTEOPATHIC PHILOSOPHY

Osteopathic physicians recognize the body's ability to regulate itself and mount its own defenses against most pathological conditions. However, when key structures are altered, a dysregulation of homeostasis can occur, requiring medical intervention and treatment. Medical treatment, from an osteopathic perspective, includes the combination of pharmacological, surgical, psychosocial, and osteopathic manipulative treatment (OMT) specific to the disease or condition as appropriate. Regarding ovarian cancer, the osteopathic approach not only considers the treatment of the disease to include these four components, but also focuses on identifying predisposing factors to anticipate risk, using both biochemical and osteopathic structural examination methods for diagnosis,

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and exploring opportunities for prevention as part of the management strategy. By properly emphasizing and applying these aforementioned components, the OstOCA provides a more thorough and efficacious plan to detect and treat this disease in addition to understanding how this disease relates to each patient's individual and unique situation.

IDENTIFYING PREDISPOSING FACTORS

A key principle of medical practice, regardless of the specific approach, is to first conduct a thorough yet focused history and physical exam on all patients. As is the case with essentially every disease process, there are known risk factors that, through taking a proper history, can be elucidated and provide clues as to whether or not there is a likelihood of the presence of a particular disease. Thus, the OstOCA should first start with stratifying a given patient's risk through critical analysis of that patient's predisposing factors for this disease. In contrast to other cancers, ovarian cancer lacks reliable and sufficient tissue or biomarker information to allow clinicians to identify women at risk, thus risk identification is primarily based on epidemiological components; the most important of which include hereditary and inflammatory factors.[2-3, 5]

HEREDITARY FACTORS

One of the most consistent and significant risk factors for ovarian cancer is a family history of ovarian cancer, particularly in first-degree relatives.[6] At least two defined inheritable genetic aberrations are known to predispose to ovarian cancer. Mutations in the breast cancer-associated genes, BRCA1 and BRCA2, account for approximately 90% of the ovarian cancers in the hereditary breast-ovarian cancer (HBOC) syndrome and as high as 85% of all hereditary ovarian cancers.[7-9] Mutations in at least four mismatch repair (MMR) genes, including MLH1, MSH2, MSH6, and PMS2, have also been implicated in hereditary nonpolyposis colorectal cancer (HNPCC) or Lynch syndrome, which accounts for up to 15% of hereditary ovarian carcinomas.[9-11] Among these mutations, there are many more genetic targets being investigated in the hopes that one or more will serve as a suitable screening biomarker. Naturally, patients may not present with a known history of these genetic mutations, but may present with certain factors suggestive of an inherited disposition to breast and/or ovarian cancer, such as a family history of breast cancer in a first-degree relative.[12] Criteria for further genetic risk evaluation are well outlined by the NCCN13 regarding breast and/or ovarian cancer, HBOC, Li-Fraumeni Syndrome, Cowden Syndrome, and others, and should be recognized and utilized when taking a history. Following the OstOCA, women who mention any historical items raising suspicion for this disease should be referred for counseling and consideration of genetic testing.

PRESENCE OF CHRONIC INFLAMMATION

As early as 1999, chronic inflammatory states have been implicated in ovarian carcinogenesis.[14] More recently, evidence suggests that the ovarian epithelium and fallopian tubes are exposed to chronic inflammation related to the normal functions of ovulation and menstruation as proven by the presence of pro-inflammatory cytokines and elevated levels of C-reactive protein, a marker for acute inflammation.[15-17] This normal inflammatory state is exacerbated in diseases such as endometriosis, as evidenced by abnormal increases in these markers in addition to endometriosis carrying an increased risk of ovarian cancer itself.[18] Another inflammatory disease to consider when approaching ovarian cancer is pelvic inflammatory disease (PID). This disease occurs most commonly as a result of untreated sexually transmitted diseases and manifests clinically as inflammation of the uterus, fallopian tubes, and ovaries. Evidence has suggested that there is an increased risk of ovarian cancer among women who have had PID, most pronounced at a young age or who are infertile, which is also, in itself an ovarian cancer risk factor.[19] Given these associations, when approaching ovarian cancer, concurrent diseases or chronic inflammatory states should be considered and asked about when taking a history.

DIAGNOSIS AND PREVENTION

As was mentioned earlier in this discussion, ovarian cancer remains a difficult problem for the medical community because of the lack of a reliable and accurate method to detect the disease at an early stage. Criteria for disease screening are set by the World Health Organization and are used to evaluate the effectiveness and benefit that screening for a certain disease would provide. Ovarian cancer meets some of these criteria, but falls short in others, thus routine screening of the general population who are asymptomatic or do no present with any known genetic aberrations at this time is not recommended by any professional society, including the U.S. Preventative task force, American Cancer Society, American College of Obstetricians and Gynecologists, and National Comprehensive Cancer Network.[13, 20-22]

UTILITY OF TUMOR MARKERS

Serum tumor markers have been evaluated for the early detection and treatment success of ovarian cancer, the most widely used of which is cancer antigen 125 (CA-125). Using tumor markers has been attractive to the medical community for a potential screening tool because the measurement of the markers is broadly available, can be repeated at appropriate intervals, minimally invasive, and does not rely on operator interpretation, which makes it preferable to ultrasonography where there is greater subjectivity of results and is more costly. CA-125 is frequently elevated in advanced-stage ovarian cancer, but is only elevated in less than 50% of stage I ovarian cancers.[23-24] Given this relationship, the use of CA-125 and other biomarkers have a niche mainly in the investigation of the disease only if there is a history of risk factors, suspicious clinical presentation suggestive of the disease, or known disease state, be it active disease or remission, but not in the asymptomatic phase.

UTILITY OF THE OSTEOPATHIC MUSCULOSKELETAL EXAM

In addition to conventional means of diagnosing a patient's medical concerns, osteopathic physicians use palpatory findings of the musculoskeletal system to aid in the physical examination of their patients. These findings provide additional information to either help aid in the diagnosis of a disease or monitor a known disease state.[25] These physical exam findings, collectively referred to as somatic dysfunctions, manifest themselves by means of viscerosomatic reflexes, the character and location of which depend on the specific organ or organs involved. Because of the dual innervation of certain viscera and somatic tissue, irritation of specific organs or organ systems in the body may produce impaired or altered function of the related components of the somatic system, namely the skeletal, arthroidal, and myofascial components in ad-

dition to their related vascular, lymphatic, and neural elements.[25-29] This viscerosomatic relationship can also be identified on physical exam more directly by the presence of Chapman's reflex points. Chapman's points are gangliform contractions or excessive tissue congestion that reflect these viscerosomatic reflexes: Visceral dysfunction is mediated by the sympathetic arm of the autonomic nervous system, thus excessive sympathetic tone from an irritated, diseased, or stressed organ leads to lymphatic stasis manifested by these myofascial nodules, or "points," which may feel boggy, ropy, shotty, and/or thickened and always exhibit tenderness to palpation on physical exam.[28-30] These changes can be identified on physical exam by physicians utilizing the OstOCA for a more revealing and targeted physical exam.

It is worth noting that because some neoplastic diseases often arise independent of innervations, these otherwise significant pathologies lacking afferent input to the CNS may not result in a significant viscerosomatic reflex response. In these cases, it is not until sufficient inflammation is established in the tissues displaced by the tumor that reflex somatic dysfunction may be identified.[27] Nevertheless, given the inflammatory nature of this disease at its origin and the known association between this disease and inflammatory diseases described previously, it is reasonable to use this in the OstOCA and expect it to be worthwhile from a diagnostic standpoint.

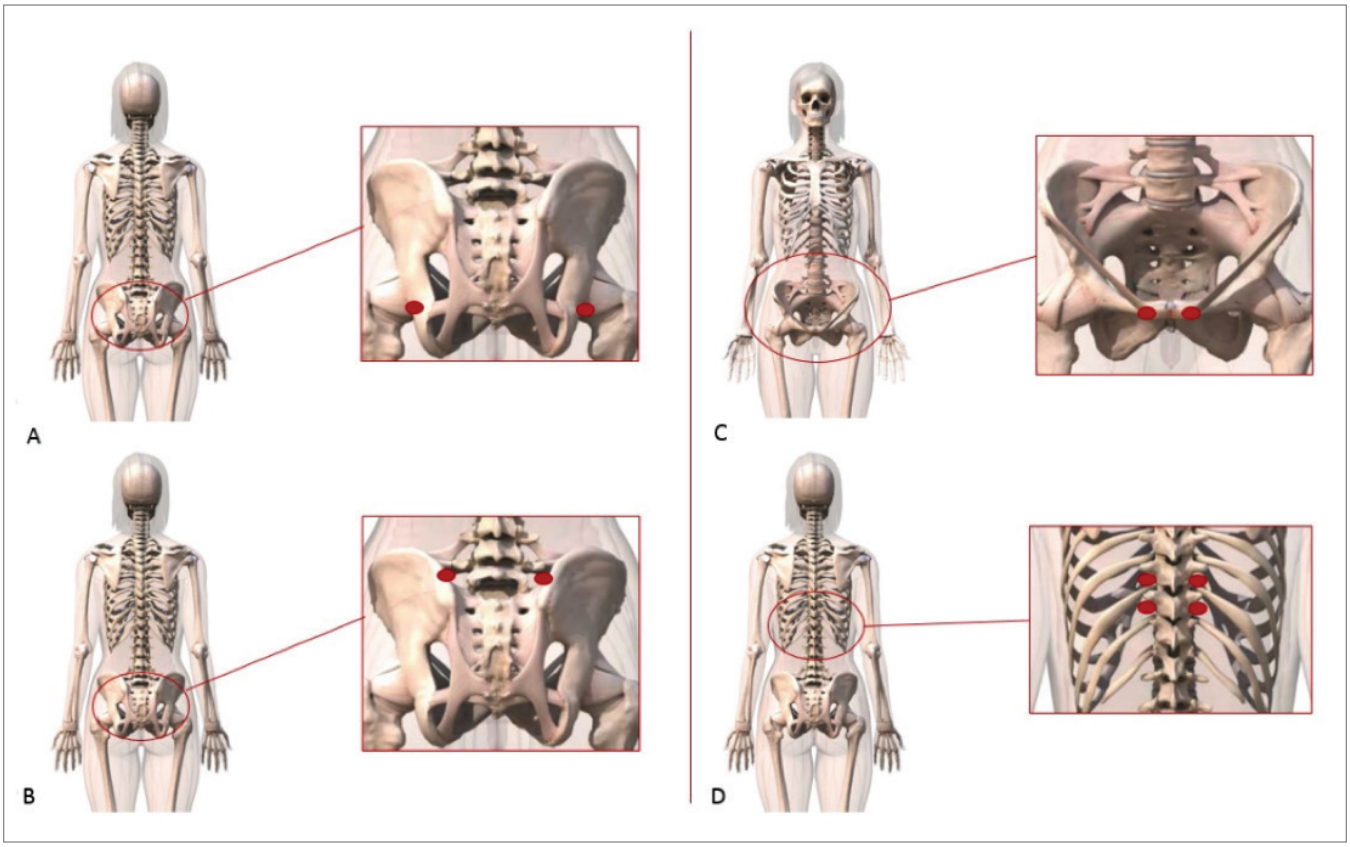
When using a musculoskeletal exam for the potential diagnosis or monitoring of ovarian cancer, the visceral components that are the prime focus are the ovaries and fallopian tubes because these structures are primarily involved in the disease process[31-32] as shown in Figure 1. Proper identification of these viscerosomatic reflexes when present allows for the detection of an otherwise clinically silent disease state and is a useful diagnostic tool when using the OstOCA.

THE ROLE OF OSTEOPATHIC MANIPULATIVE TREATMENT IN THE OSTOCA

The role of OMT in neoplastic diseases has been one of great debates among the osteopathic medical community. Despite speculation, there has not been any evidence that manipulations promote metastasis of malignant cells by increasing circulation of blood and lymphatic fluid. In fact, an argument can be made that by enhancing lymphatic flow, the neoplastic cells would be subject to identification and removal by the natural anti-tumor components of the immune system[25] that may reduce tumor burden. Complicating this debate is the fact that the plethora of different neoplastic processes each exhibits its own specific and unique behavior, pathogenesis, and response to treatment and thus cannot be approached in the same manner.

FIGURE 1:

Chapman's Reflex Points Associated with the Ovaries and Fallopian Tubes.



A) Fallopian tubes, anterior: a gangliform state can be fund midway between the acetabulum and the sciatic notch. **B)** Fallopian tubes, posterior: a gangliform contraction can be found between the posterior superior iliac spine of the ilium and the spinous process of the fifth lumber vertebrae on the iliolumbar ligament. **C)** Ovary, anterior: a gangliform contraction can be found on the anterior surface of the pubic bone from the pubic tubercle inferiority to the origin of the adductor muscles. **D)** Ovary, posterior: a gangliform contraction between the 9th and 10th transverse space indicates an involvement of the inner half of the ovary, while a gangliform contraction between the 10th and 11th dorsal intertransverse space indicates an involvement of the outer half of the ovary.

Therefore, a blanket statement relating the benefits or risks of the use of OMT in the treatment of cancer is not one that can be made with any accuracy or appropriateness. So where does OMT fit into the osteopathic approach to the treatment and management of ovarian cancer? According to the OstOCA, OMT is most appropriately utilized following surgical primary treatment (set forth by the NCCN protocol). The proposed benefits of the postoperative OMT, as outlined in the OstOCA, include: preventing cancer dissemination and metastasis, reducing the need for analgesics postoperatively, and enhancing the body's immunity and return to homeostasis postoperatively, as discussed below.

PREVENTING CANCER DISSEMINATION & METASTASIS

Surgery of the primary tumor is known to create profound metabolic, neuroendocrine, inflammatory, and immunological stress due to the nature of the procedures required to identify and remove the cancerous tissue.[33-34] This surgical stress response involves the release of chemical mediators that have been implicated in carcinogenesis, and it is these mediators that can cause an up regulation of major pro-malignant pathways promoting local and distant metastasis. After surgical removal of the primary tumor, an intact cell-mediated immune response is thought to be important for elimination of residual disease and micrometastases.[35-38] Natural Killer (NK) cells have been shown to have a significant role in controlling these metastases, and intactness of the perioperative NK cell response is thought to be involved in tumor control.[39] OMT in the OstOCA aims to reduce these deleterious effects of perioperative stress that have been implicated in tumor genesis and blunted NK cell response.

REDUCING THE NEED FOR ANALGESICS

Postoperatively, patients will inevitably experience pain, which itself, has been shown to cause suppression of NK cell activity and promotion of tumor development in animal models.[40-41] To control this pain, opioids are commonly used, which have been shown to inhibit cellular and humoral immune function in humans in addition to promoting angiogenesis, which tumors use to their advantage. Morphine, a popular post-operative analgesic, specifically has been shown to inhibit spontaneous and cytokine-enhanced NK cell cytotoxicity, and thus is implicated in increased risk of tumor genesis and recurrence.[42-44] OMT has been shown to reduce patient opioid analgesic use postoperatively through reducing hypersympathetic tone and nociceptive facilitation caused by the stress of surgical treatment.[45-46] By providing a reduced need for opioid analgesics postoperatively, the OstOCA confers a decreased insult to antitumor mechanisms of the immune system, specifically the NK cell response.

ENHANCING THE BODY'S IMMUNITY

In addition to managing pain postoperatively, surgical treatment presents several more challenges to a patient's recovery, including an increase in sympathetic tone, nociceptive facilitation, decreased respiratory effort, lymphatic congestion, postoperative ileus, and threat of infection,[28] all of which impair the body's natural immunity.[25, 28, 34] To combat these adverse results of essential surgical treatment of ovarian cancer, the OstOCA utilizes specific osteopathic techniques that have been shown to reduce hypersympathetic tone and somatic nociceptive stimuli,[47-52] diminish lymphatic congestion by improving flow,[47, 53-54] and stimulating the immune system by enhancing the functions of the spleen.[54-56]

An important consideration for enhancing the body's natural immunity when using the OstOCA is detecting the presence of preoperative somatic dysfunction noted on musculoskeletal examination. The presence of somatic dysfunction in a preoperative patient may be a factor complicating an otherwise normal outcome due to increased pain, decreased arteriolar circulation, and decreased venous and lymphatic return. As somatic dysfunction can cause nociceptive activity and facilitation independent of similar effects that occur postoperatively, it is important to normalize any somatic dysfunction to not further exacerbate the adverse effects of surgical treatment and weaken the body's ability to heal.[53, 57]

MANIPULATION TECHNIQUES USED IN THE OSTOCA

The techniques that the OstOCA involves include sequential occipitoatlantal (OA) decompression, Sibson's fascial release, soft tissue treatments, indirect sacral myofascial release, balanced ligamentous tension, rib raising, paraspinal inhibition, direct splenic stimulation, and pectoral retraction. The descriptions of how these techniques are to be performed[25, 28] is summarized in Figure 2 *(page 46)*. The conditions they affect and location are summarized in Figure 3 *(page 47)*. These techniques should be performed postoperatively in unconscious, pharmacologically paralyzed patients as to achieve the best possible results of treatment and also to reliably reproduce the conditions to which previous studies have used to demonstrate efficacy of these treatments.[47]

While each of these techniques work together in a step-wise manner to achieve the overall aforementioned treatment goals, they each have individual functions to attain postoperative improvement and cancer prevention. O-Yurvati et al[47] studied the use of OA decompression, Sibson's fascial releas, indirect myofascial release, balanced ligamentous tension, and rib raising to provide beneficial, physiologic improvements in fluid homeostasis, lymphatic flow, balance of sympathetic flow by addressing both sympathetic and parasympathetic components, and respiratory function postoperatively, which has been shown to quicken recovery in patients who have undergone surgical procedures. Additionally, rib raising has been shown by Herman[48] to decrease the incidence of postoperative ileus by 99.7% and was supported by a more recent study by Baltazar et al.[49] that demonstrated OMT applied after major gastrointestinal operations was associated with decreased time to flatus and decreased length of postoperative hospital stay. Herman discusses the protective benefit of rib raising at spinal levels T5-L2, but given that L1-L2 spinal levels do not have rib heads to use, an equivalent technique of paraspinal inhibition[25, 28] is suggested by the OstOCA to achieve the same benefits. The use of OA decompression, rib raising, and thoracic pump (substituted by pectoral retraction in OstCA) has been used and shown to demonstrate benefits to the immune system, specifically demonstrated in a study by Saggio et al.[58] This study demonstrated OMT's ability to increase secretory IgA (sIgA), and thus, potentially improve immune system function in a stressed but otherwise healthy individual. OstCA has replaced the thoracic pump with pectoral retraction because this technique has shown greater efficiency—two minutes of pectoral retraction is believed to provide as much assistance to lymphatic flow as up to 10 minutes of thoracic pump treatment.[28] sIgA, being the major immunoglobulin secreted by the mucosal system, makes it a major determinant in the immunity of the viscera involved in the region of the pelvis and abdomen,[59] thus techniques that

FIGURE 2:

Proposed order and descriptions of the osteopathic manipulative treatment techniques used in this approach to ovarian cancer.

Occipitoatlantal Decompression	The osteopathic physician contacts the posterior base of the skull (occiput) with fingers of both hands and applied gentle superior, posterior, and lateral pressure traction. This is done to release tension between the occipital condyles and the first cervical vertebra (atlas) within the occipitoatlantal articulation.
Sibson's Fascial Release	From the head of the bed, the osteopathic physician's thumbs contact Sibson's fascia bilaterally posterior to the clavicles and press caudally to stretch the fascia.
Soft Tissue Treatments	The osteopathic physician, while the patient is in the supine position, a gentle, rhythmic lifting of the back in the thoracolumbar and lumbosacral areas is performed, causing a slight extension movement of the spine. This is performed until tissue relaxation occurs but not for more than five minutes.
Indirect Sacral Myofascial Release	The osteopathic physician makes light contact on the sacral fascia of the sacrum with both hands and assess the direction of rotation of greatest ease. This position is held maintaining light pressure until a release is felt and strain is released.
Balanced Ligamentous Tension	The osteopathic physician places both hands under the patient's back beneath the bed sheet and contacts the spinous processes of the T10-L2 and posterior ribs where present, feeling for ligamentous tension. Very gentle pressure and minor movements of the vertebrae and ribs are applied until a point of balanced tension is felt and strain is released
Rib Raising	From the head of the bed, the osteopathic physician's hands are slid under the patient's upper back, contacting the rib heads at the thoracic level. Upward and lateral pressure is then applied. This is done to address thoracic levels T5-T9 to encourage lymphatic drainage and then T10-T12 to reduce hypersympathetic tone relating to the pelvic viscera.
Paraspinal Inhibition	Producing the effects of rib raising in these segments cannot be performed through rib heads in the L1-L2 spinal areas, therefor paraspinal inhibition is used to treat the effects of hypersympathetic outflow in this area in addition to aiding in ileus prevention. The osteopathic physician, with the patient in the supine position, passes both hands under the back of the patient contacting the erector spinae mass. The hands are then closed, pulling the two muscles toward each other between the fingers and the eminences of the operator. The physician alternates pressure until a there is a sense of relaxation.
Direct Splenic Stimulation	With the patient in the supine position with their knees flexed, the osteopathic physician applies alternating bimanual compressions and relaxations to the tissues in front of and behind the spleen at a rate of 20 times per minute with the compressions being slow and deliberate and the relaxations abrupt.
Pectoral Retraction	With the patient in the supine position with their knees drawn up and hands on the abdomen, the osteopathic physician at the head of the patient gently grasps the anterior axillary fold (pectoralis muscles) and gentle traction is applied in a medial, anterior, and cephalic direction. This is held while the patient breathes normally or with slight increase in volume. Two minutes of this technique provides as much assistance to lymphatic flow as five or more minutes of thoracic pump treatment.

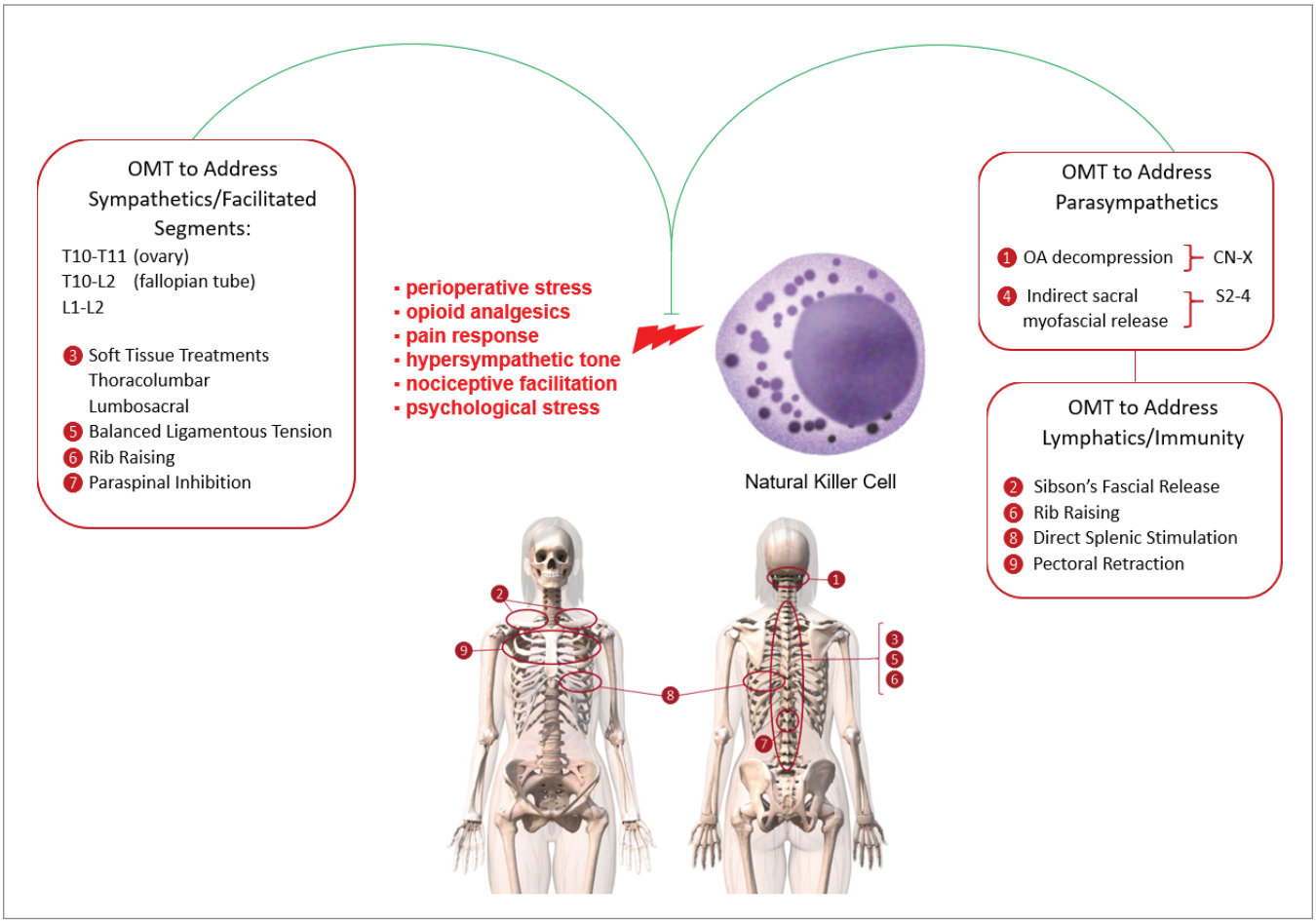
enhance this arm of the immune system may potentially prove very important when concerning recovery from surgery for ovarian cancer.

Another major player in the OMT protocol that may provide immunological benefit is direct splenic stimulation. The benefits of this technique were first introduced in a study by Castilo and Ferris-Swift[55] and was further clarified by Noll et al.[56] and Measel.[54] The original study by Castilo and Ferris-Swift used direct splenic stimulation in patients with acute infectious diseases and showed that splenic stimulation causes a post-treatment rise in serum leukocyte counts, a decrease in erythrocyte counts, and generally stimulates the immune system. These findings were supported by Measel et al., who reported an enhanced immunologic response in subjects who received OMT as compared with a control group by measuring antibody response to pneumococcal polysaccharide assayed by bacterial agglutination and passive heagglutination. In another, larger study, Jackson et al.[60] supported Measel's findings when they found subjects who received OMT had an apparent enhancement of immunologic response after the application of the lymphatic and splenic pump techniques (which is equivalent to pectoral retraction and direct splenic stimulation respectively in OstOCA).

Collectively, these techniques address two of the three goals of OMT treatment in the OstOCA, namely, "enhancing the body's immunity and return to homeostasis postoperatively" and "preventing cancer dissemination and metastasis." The remaining goal of OMT treatment mentioned in the OstOCA, "reducing the need for analgesics postoperatively" is addressed by manipulation techniques of soft tissue treatment and indirect sacral myofascial release. Goldstein et al.[45-46] demonstrated that preoperative intravenous morphine sulfate with these manipulation techniques postoperatively reduces patient analgesic use after a total abdomi-

FIGURE 3:

Effects and location of the osteopathic manipulative treatment techniques used in this approach to ovarian cancer.



nal hysterectomy (TAH) in the immediate 48-hour postoperative period. This study is of particular significance for OstOCA because TAH is a commonly required surgery for the treatment ovarian cancer. Therefore, the efficacy of these manipulation techniques at reducing the need for analgesics following this essential surgical treatment bolsters their position as a key component of the OMT protocol.

IMPORTANCE OF PSYCHOSOCIAL SUPPORT IN THE OSTOCA

According to the osteopathic concept of health and disease, a person is a total biochemical, biophysical, and psychic entity. Therefore, in treatment and management of a disease, primary consideration is given to the individual who has the disease rather than the disease itself. The severe emotional distress accompanying a diagnosis of cancer and its initial treatment is a significant and often overlooked component of the treatment and management, especially when the disease outcomes are known to be poor.[61] Osteopathic physicians in the field of psychiatry have postulated that an altered emotional state can cause somatic dysfunction,[62] and have shown that certain psychiatric diseases, such as schizophrenia, produce consistent somatic dysfunctions in patients that thereby lower their potential for immunity and inherent defense mechanisms against disease.[63]

More recently, the resulting adverse effects of severe emotional stress have been shown to cause deleterious effects on the immune response in cancer, particularly effecting NK cell activity. A study by Lutgendorf et al.[64] established a relationship between psychosocial factors and a functional cellular immune parameter in immune cells isolated from a human tumor of ovarian cancer: Patients with greater social support had higher levels of NK cell activity at the tumor level, whereas patients with greater distress had more impaired NK cell activity. Although the exact mechanisms by which psychosocial factors affect the immune response in ovarian cancer is not well understood, Lutgendorf et al. notes that there are beta-adrenergic receptors on normal ovarian tissue, and direct connections between the ovary and the CNS via the sympathetic nervous system (the organization and relevance of which were discussed earlier in the viscerosomatics section and form a key component of OstOCA). Both of these components may provide direct pathways by which psychological states could modulate ovarian catecholamines, and thereby, explain how psychological factors affect the local immune response within the ovary. This thought process lends its support to the utility of the viscerosomatic relationships in both diagnosis and treatment of this disease.

Given the integral relationship between psychosocial factors and ovarian cancer, it is paramount that these factors are not only addressed when utilizing OstOCA, but that proper support and treatment of those factors are employed with as much priority as the primary treatments.

APPLYING THE OSTEOPATHIC APPROACH TO THE TREATMENT AND MANAGEMENT OF OVARIAN CANCER

The protocol for applying OstOCA for the primary treatment of ovarian cancer is summarized in Figure 4. The process begins, as all approaches to disease do, with a history and physical exam. This initial diagnostic step can be initiated in various ways as dictated by the NCCN protocol. After receiving the diagnostic results, if surgery is indicated, it should be initiated as the primary treatment[25] and followed by postoperative OMT. Following treatment, psychosocial support should be addressed and appropriate referrals made in order to ensure optimal recovery and maintenance.

LIMITATIONS OF OSTOCA

While OstOCA was designed using evidence-based concepts established by researchers in osteopathic medicine in addition to the allopathic physicians who worked to develop the NCCN protocol for ovarian cancer treatment,[25] it has yet to be subject to direct evaluation to determine its efficacy in its target population. So while this initial presentation does not claim to do anything more but propose the structure and possible utility of this model, it must be reiterated that future studies investigating its efficacy beyond theory are required.

HOW ABOUT NON-SURGICAL CANDIDATES?

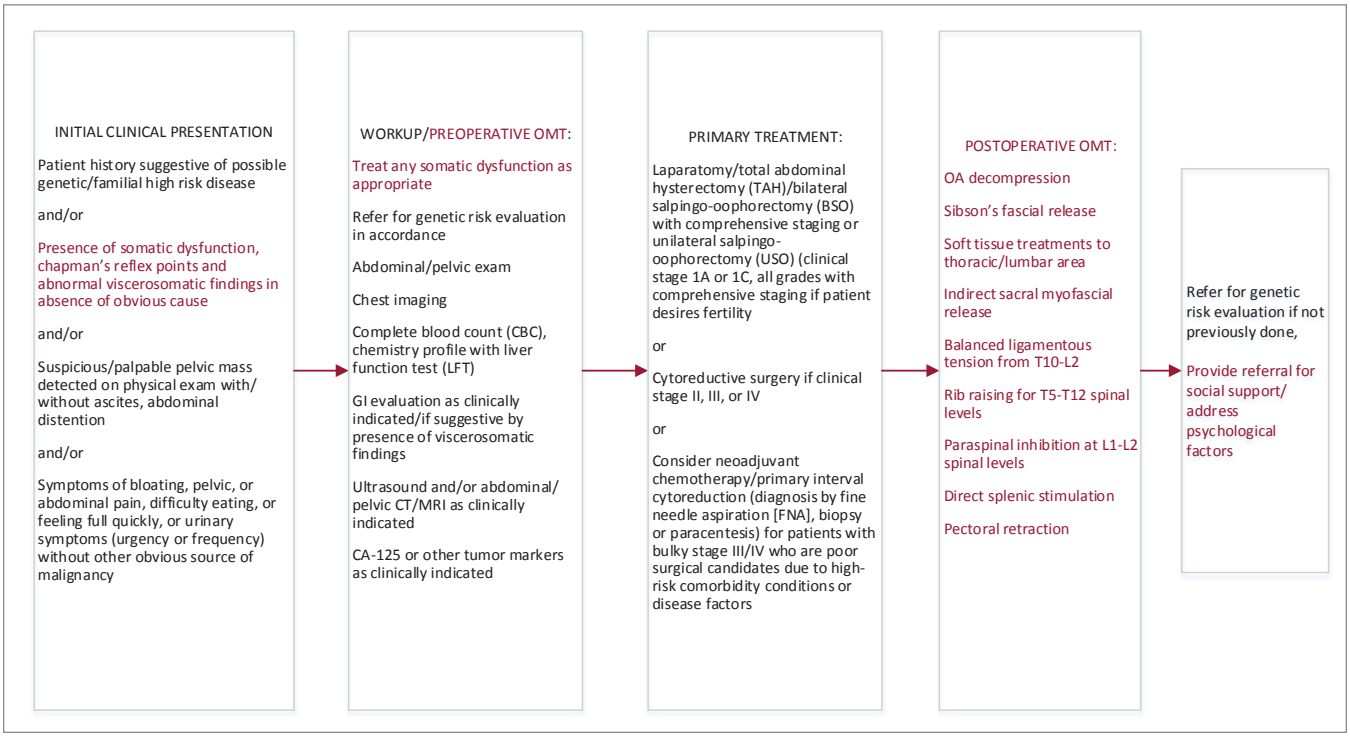
Inherent in OstOCA is the need for surgical intervention in the treatment of ovarian cancer. The decision to focus of surgical candidates was twofold: The efficacy of these techniques have been primarily studied in surgical candidates and late-stage disease commonly requires surgical intervention. Thus, claims to the efficacy of incorporating OMT into post-treatment protocols for patients managed with non-surgical treatments have less support and less confidence. However, there is indirect evidence to suggest osteopathic manipulative treatments involved in OstOCA can provide benefit to nonsurgical treatments of ovarian cancer, namely chemotherapy. Manipulation techniques, specifically rib raising, paraspinal inhibition, direct splenic stimulation, and pectoral retraction, have been shown to shorten hospital stays and hasten recovery in acute disease states.[25, 28, 49, 54-56, 58, 65-66] While infection and chemotherapeutic agents both cause damage to the body and require healing, the association between the two is not strong enough to propose OstOCA be used in the same manner as in surgical candidates.

CONCLUSION

Ovarian cancer still remains a lethal disease in the United States and research conducted in many facets of medicine, including genetics, pharmacology, surgery, oncology, and gynecology, is trying to improve this situation. OstOCA provides a novel approach to the treatment and management of ovarian cancer and holds promise to potentially improve outcomes for patients with ovarian cancer. Future studies designed to properly test this model in its intended population are the next step into defining a role for osteopathic concepts in the treatment and management of ovarian cancer. Should OstOCA prove empirically sound and

FIGURE 4:

Algorithm for the osteopathic approach to the treatment and management of ovarian cancer



clinically useful, it could potentially open the door for new proposed protocols for osteopathic management of other neoplastic processes and provide a new frontier for osteopathic medicine and research.

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