**Clinical Integration of Osteopathic Manipulative Medicine**

**Internal Medicine: Diabetes Mellitus**

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**Introduction:**

Diabetes mellitus is a chronic condition that affects approximately one-tenth of the United States population.\(^1\) It commonly presents in conjunction with other comorbidities such as obesity and metabolic syndrome and can lead to cardiovascular and kidney complications that lead to decreased overall quality of life.

Type 2 diabetes is characterized by hyperglycemia due to increased insulin resistance and decreased insulin production. In normal conditions, the beta islet cells of the pancreas produce insulin in response to elevated levels blood glucose. In diabetic individuals, beta-cell dysfunction leads to deceased insulin production, decreased beta-cell sensitivity to glucose, and decreased tissue sensitivity to insulin. This insulin resistance has been linked to increased release of inflammatory markers by adipocytes (e.g. adipokines, resistin, TNF-alpha, IL-6, CRP, etc). Furthermore, this can lead to plaque formation leading to decreased blood flow and subsequently microvascular (e.g. retinopathy, peripheral neuropathy, nephropathy and diabetic gastroparesis) and macrovascular (e.g. myocardial infarction).\(^2\) A similar pathogenesis has also been theorized to the cause of musculoskeletal complication such as adhesive capsulitis, chronic low back pain, and osteopenia.\(^3\)

**Patient presentations:**\(^3,4\) Patients present with symptoms of hyperglycemia which include polyuria, polydipsia, polyphagia, and initial weight loss.

Additional symptoms:

- Abnormal Laboratory Findings:
  - Elevated fasting serum glucose ≥126mg/dL or random serum glucose ≥200mg/dL
  - Elevated Hemoglobin A1c ≥ 6.5
- Gastrointestinal
• Diabetic gastroparesis which will present with bloating, abdominal distention and fullness

• Neuropathy
  o Peripheral neuropathy
  o Proximal Neuropathy
  o Pins and needles in median nerve distribution and thenar eminence muscle atrophy due to carpal tunnel syndrome
  o Autonomic neuropathy

• Ophthalmology
  o Blurred vision
  o Cataracts
  o Retinopathy

• Cardiovascular and Renal
  o Glucosuria
  o Proteinuria
  o Microscopic hematuria
  o Hypertension

• Musculoskeletal
  o Lower back pain due to connective tissue and degenerative disc damage
  o Decreased range of motion of the shoulder presenting as “frozen shoulder”
  o Duputreny’s contracture

**Differential diagnosis:**
Hyperglycemia and insulin resistance are associated with numerous chronic comorbidities

• Metabolic
  o Obesity
  o Metabolic Syndrome
  o Hypothyroidism
  o Hyperthyroidism
  o Hyperosmolar Hyperglycemic Non-Ketotic State

• Cardiovascular
  o Hypertension
  o Hypercholesterolemia
  o Coronary Artery Disease

• Gynecology
  o Polycystic Ovarian Syndrome (PCOS)

• Neuropathy
  o Carpal tunnel syndrome
  o Autonomic neuropathy

• Musculoskeletal
Clinical pearls: 3,4,5,6

- Viscerosomatic reflexes can play an important role in the presenting symptoms of diabetes
  - The viscersomatic levels of the pancreas are T5-T9
- Blood glucose levels can be affected by other factors such as stress, pain, and sleep.
  - Keep in mind the first osteopathic tenet “the body is a unit.” Addressing psychosocial aspects related to regulation of blood glucose can allow for holistic treatment, such as reducing cognitive or behavioral barriers to self-management.
- Physical activity and skeletal muscle activity decreased blood glucose by increasing uptake through increased translocation of GLUT4 transporters on the cell membrane.
  - Treating musculoskeletal dysfunctions can optimize a patient’s ability to partake in physical activity as well allow for optimal functioning of glucose uptake.
- Diet also plays a large role in the control and prevention of Type 2 diabetes. It is important that physicians counsel and educate patients on the healthy lifestyle and diet practices.
- In addition, patients with diabetes should have close monitoring and regular follow-up. Patients should receive annual eye-exams and foot exams to evaluate for retinopathy and diabetic ulcers, respectively.
- Lastly, patients should receive annual influenza vaccinations as well as the pneumococcal vaccinations to prevent complications.

OMM Integration:

OMT may be a useful modality in treating complications and comorbidities associated with diabetes. Furthermore, a review of previous literature suggests that OMT techniques such as pancreatic stimulation through the first rib can decrease blood glucose levels and increase insulin secretion.3

A pilot study of 40 subjects noted that increased bogginess and fullness in the posterior cervical spine correlated with higher random serum glucose. Therefore, lymphatic drainage and treatment of the cervical spine can be a useful technique.3,5,8 This also held to be true in a case study of a subject with diabetic gastroparesis. After 6 OMT sessions, the subject noted decreased nausea from 4 to 2 and retching from 4 to 0 on the GCSI scale.6

OMT has also shown benefit in the management of musculoskeletal complications. A subgroup analysis of the OSTEOPATHIC trial noted a significant decrease in LBP in 19/34 subjects diagnosed with diabetes mellitus. The trial also noted a significant decrease in TNF-alpha levels in diabetic subjects treated with OMT.7 In addition, Spencer’s technique has been shown to
increase range of motion in patients with adhesive capsulitis. Lastly, another study demonstrated the application of OMT in the lengthening the carpal tunnel ligament, thereby providing relief from carpal tunnel syndrome.3,5,8

**Osteopathic Structural Examination:**3,5,6,7,8

- Cranial
- Cervical spine
- Ribs
- Thoracic T5-T11
- Lumbar spine
- Sacrum
- Diaphragm
- Shoulder
- Chapman points

**Possible Treatment Options:**3,5,6,7,8

- Suboccipital release
- Thoracic Outlet Release
- Spencer technique
- Carpal Tunnel Release
- Pancreatic Stimulation through Rib 5
- Rib raising
- Thoracic, Lumbar spine and Sacrum Soft Tissue Techniques
- Celiac Ganglion Inhibition
- Lymphatic pumps (e.g. liver, spleen, pedal pump)
- Treatment of Chapman reflexes

**Citations:**


