“Osteopathic Manipulative Treatment in Concussion Management –
An Evidence Review”
Brett R. DeGooyer, D.O.

OSTEOPATHIC MANIPULATIVE TREATMENT
IN CONCUSSION MANAGEMENT –
AN EVIDENCE REVIEW
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DISCLOSURES
• NONE THAT ARE FINANCIAL
• NONE THAT ARE PROFESSIONAL
• NONE THAT ARE PERSONAL

“Welcome back, sir. Are you planning on bringing our guest for one night only, or will
this be your usual extended stay?”

OBJECTIVES
• REVIEW CONCUSSION STATISTIC, SYMPTOMS, AND PATHOPHYSIOLOGY
• DISCUSS EVIDENCE FOR MANUAL TREATMENTS (OMT) IN CONCUSSION
• DISCUSS EVIDENCE FOR MANUAL TREATMENTS (OMT) IN SYMPTOMS OF
CONCUSSION
• REVIEW PROPOSED OMT SEQUENCES/PRINCIPLES FOR CONCUSSION TREATMENT
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CONCUSSION STATISTICS

CDC estimates 1.6–3.8 million sports-related concussions annually due to underreporting, rates may be double.

- Reporting by high school football athletes is roughly 47.3%.
- Annual cumulative (direct and indirect) cost of sport-related concussin in the United States is roughly $56 billion.
- 2001-2009 the estimated number of sports and recreation-related TBI visits annually to EDS increased 62%, from 153,375 to 248,418.
- For ages 15-19 years, most concussions occur:
  - Male: football (30.3%), bicycling (9.7%), basketball (9.0%)
  - Female: soccer (16.0%), basketball (14.6%), gymnastics (9.1%)
- 69% occur during competition vs practice.
- In the USA, 24,544 secondary schools / 7,795,658 athletes, less than 50% of these schools have ATC coverage.

CONCUSSION BASICS – SIGNS/SYMPTOMS

THINKING (COGNITIVE):
- Loss of consciousness, post-injury disorientation, posttraumatic amnesia, difficulty thinking clearly, feeling slowed down, difficulty concentrating, difficulty remembering new information.

PHYSICAL (SOMATIC):
- Headache, neck pain, visual disturbances, sensitivity to light (photophobia), phonophobia, balance or coordination issues, feeling tired and having no energy, autonomic dysregulation (hypersympathetic state), and symptoms of concussion.

EMOTIONAL (BEHAVIORAL):
- Irritability, sadness, mood lability, nervousness and anxiety, depression.

SLEEP (CIRCADIAN):
- Sleeping more, sleeping less, trouble falling asleep, restless sleep, trouble staying asleep.

CONCUSSION BASICS – PATHOPHYSIOLOGY

NEURONAL DEPOLARIZATION:
- Massive influx of sodium and efflux of potassium.
- Release of excitatory amino acids, further efflux of potassium.
- Results in the effective depolarization of affected neurons, leading to depolarization of downstream neurons.

LOCAL LACTIC ACID ACCUMULATION:
- Due to massive degree of the induced ion fluxes, a large amount of ATP is required to operate the sodium-potassium pump.
- Increased demand for ATP results in an increase in glycolysis.
- Leads to local lactic acid accumulation.

DECREASED CEREBRAL BLOOD FLOW WITH MISMATCH OF CEREBRAL GLUCOSE SUPPLY AND DEMAND:
- Concomitantly, there is a decrease in cerebral blood flow for a period of days to weeks.
- Increased demand for glucose and its end product, ATP, which cannot be supplied.
- Supply-demand mismatch is thought to result in the cognitive dysfunction, autonomic dysregulation (hypersympathetic state), and symptoms of concussion.
ON OSTEOPATHY

THE PHILOSOPHY OF OSTEOPATHIC MEDICINE IS BASED ON FOUR KEY PRINCIPLES:
1. THE BODY IS A UNIT: BODY, MIND, AND SPIRIT.
2. THE BODY IS CAPABLE OF SELF-REGULATION, SELF-HEALING, AND HEALTH MAINTENANCE.
3. STRUCTURE AND FUNCTION ARE RECIPROCALLY INTERRELATED.
4. RATIONAL TREATMENT IS BASED UPON THESE PRINCIPLES.

OSTEOPATHIC MANIPULATIVE TREATMENT

GOALS:
- RETURN TO LEARN
- RETURN TO PERFORM
- RETURN TO SLEEP
- RETURN TO "NORMAL"

OMT AND CONCUSSION – LITERATURE REVIEW

- NO DEDICATED RESEARCH ON OMT AND THE SPECIFIC TREATMENT OF CONCUSSION HAVE BEEN PUBLISHED (MARCH 27, 2015).
- NO DATA ON CASE REPORTS OR CLINICAL TRIALS (MARCH 27, 2015).
- ONE PUBLICATION ON PROPOSED RESEARCH.
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OMT AND C-SPINE INJURY/NECK PAIN – LITERATURE REVIEW

• MUCH HAS ALREADY BEEN PUBLISHED.

OMT FOR CONCUSSION SYMPTOMS – LITERATURE REVIEW

• HEADACHE17,18,19
• DIZZINESS20,21,22,23
• VISUAL DISTURBANCES24,25,26
• BALANCE27
• NAUSEA (NONE FOUND)
• DEPRESSION28,29
• FATIGUE30
• ANXIETY (NONE FOUND)
• AUTONOMIC DYSREGULATION31,32,33
• SLEEP PATTERN34,35

OMT BENEFITS

• INCREASED RANGE OF MOTION.
• DECREASED PAIN.
• IMPROVED ACTIVITIES OF DAILY LIVING.
• SHORTENED DISABILITY TIME.
• REDUCED RELIANCE ON MEDICATIONS.
• IMPROVED POSTURAL EFFICIENCY.
• DECREASED OVERALL MEDICAL COST.

“All bones are sesamoid bones.” - Steve Levin, MD

SOMATIC DYSFUNCTION
SCREENING & DIAGNOSIS

- FACILITATED SPINAL SEGMENT:
  - CAN ACT AS A "NEUROLOGIC LENS" THROUGH WHICH UNRELATED STRESSORS CAN AMPLIFY THE SYMPATHETIC OUTFLOW TO TARGET ORGANS AND TISSUE.
  - TWO HALLMARKS INCLUDE:
    - LOWERED NEURONAL THRESHOLD
    - HYPERSENSITIVITY OF RECEPTIVE FIELDS
- VISCEROSESOMATIC REFLEXES:
  - LOCALIZED VISCERAL STIMULATION PRODUCES PATTERNS OF REFLEX RESPONSE IN SEGMENTALLY RELATED SOMATIC STRUCTURES.
- SOMATOVISCERAL REFLEXES:
  - LOCALIZED SEGMENTAL SOMATIC STIMULATION PRODUCES PATTERNS OF REFLEX RESPONSE IN RELATED VISCERAL STRUCTURES.
THE OMT PRESCRIPTION: TREATMENT CONSIDERATIONS

- TOLERANCE AFFECTED BY HEALTH STATUS AND AGE.
  - SICKNESS, > OR < AGE = DECREASED TOLERANCE
- PATIENT TOLERANCE SHOULD ALWAYs DICTATE THE LEVEL OF AGGRESSIVENESS
- APPROPRIATE OMT WILL RESULT IN:
  - LESS PHYSICAL STRESS
  - INCREASED CIRCULATION (Tissue perfusion)
  - DECREASED PATIENT DISCOMFORT

THE OMT PRESCRIPTION: TREATMENT CONSIDERATIONS (CONCUSSION)

- AS A GENERAL GUIDING PRINCIPLE, DO NOT USE ANY OMT PROCEDURES AT THE GAME/EVENT, OR WITHIN THE FIRST 24 HOURS.
  - IF THEY ARE USED, USE GENTLER TECHNIQUES TO AVOID AGGRAVATING SNS.
- TREATMENT MAY BE PERFORMED WITHIN THE FIRST 24 HOURS IF:
  - SYMPTOMS ARE IMPROVING
  - SYMPTOMS ARE RATED AS MILD → MODERATE
  - THERE IS ONLY ONE REPORTED SYMPTOM (E.G. HEADACHE OR NAUSEA)
  - INITIAL APPLICATION OF PROCEDURES IDEALLY OCCUR BETWEEN 24-36 HOURS AFTER.
- AVOID USING HVLA (THREATING) TECHNIQUES WITHIN THE FIRST 72 HOURS.
- SIMPLE NEUROCognitive ASSESSMENT WITH EACH REEVALUATION FOR OMT
- PATIENT'S DAILY SYMPTOM DIARY SHOULD BE REVIEWED.

THE OMT PRESCRIPTION: SEQUENCING

- NEUROENDOCRINE, MYOFASCIAL, AND LYMPHATIC SEQUENCE:
  - RELEASE OF MYOFASCIAL RESTRICTIONS OF THE FEET, KNEES, AND LOWER EXTREMITIES
  - FEMORAL DIAPHRAGM RELEASE
  - TREAT ANY SACRAL DYSFUNCTION
  - RELAX OR DOME THE ABDOMINAL DIAPHRAGM
  - RESPIRATORY DIAPHRAGM RELEASE
  - ER BALANCING, ER RAISING, AND/OR PARASPINAL INHIBITION (T1-L2)
  - RELEASE OF THORACIC INLET
  - LYMPHATIC PUMP (THORACIC OR PEDAL, DEPENDING ON PATIENT’S TOLERANCE AND LEVEL OF PAIN)
  - CV-4
**THE OMT PRESCRIPTION: SEQUENCING**

- **"KOZAR" APPROACH**
  - OA (IMPAIRED FLEXION)
  - LOWER CERVICAL & MID-UPPER THORACIC (IMPAIRED EXTENSION)
  - RIBS 1-2 (ELEVATIONS)
  - LUMBOSACRAL (COMPRESSION)
  - ANS INNERVATION TO HEAD
  - LYMPHATIC DRAINAGE TO HEAD
  - CRANIAL SEQUENCE – VENOUS SINUS DRAINAGE, OCCIPITAL
  DECOMP/COMPRESSION VIA SACRAL RELEASE, AND CV4

- **"MCELROY & MCLAUGHLIN" SEQUENCE**
  - FIRST RIB (ELEVATION) - MET
  - C7-T1 – ARTICULATORY MOBILIZATION
  - OA – C5, MET, SUBOCciput traction
  - AA – MET

- **IN: KARAGEANES - PRINCIPLES OF MANUAL SPORTS MEDICINE**
  - OCCIPITAL RELEASE
  - MUSCLE ENERGY OF THE OCCIPITOAATLANTAL AND ATLANTOAXIAL JOINTS
  - CORRECTION OF CERVICOthORACIC DYSFUNCTIONS
  - MYOFASCIAL RELEASE TO TRAPEZIUS, LEVATOR, AND CERVICAL SOFT TISSUE
THE OMT PRESCRIPTION: DOsing

• HOW OFTEN SHOULD THE PATIENT BE TREATED?
  1. DEPENDS UPON THE PATIENT’S RESPONSE TO THE INITIAL INTERVENTION.
  2. ANY REBOUND REACTION SHOULD NOT LAST MORE THAN 24 HOURS.
  3. REEVALUATE 48 HOURS AFTER INITIAL TREATMENT.
  4. ACUTELY – REEVALUATIONS EVERY 72 HOURS AFTER THE SECOND TREATMENT, UNTIL SYMPTOM RESOLUTION ACHIEVED.
  5. SYMPTOM RESOLUTION SHOULD PROGRESSIVELY LAST LONGER FOLLOWING EACH TREATMENT.
  6. FAILURE OF RESOLUTION PERIODS TO INCREASE INDICATES THAT THE DIAGNOSIS MAY BE INCOMPLETE.
  7. CONTRIBUTING CAUSES MUST BE THOROUGHLY EXAMINED, IDENTIFIED, AND TREATED.
  8. CHRONICALLY – REEVALUATIONS EVERY 1-3 WEEKS; GRADUALLY LENGTHEN AS SYMPTOMS DECREASE.

IN CONCLUSION...

• TREATING SPECIFIC AREAS OF SOMATIC DYSFUNCTION REDUCES THE BODY’S ENERGY EXPENDITURE BY:
  1. REDUCING ALLOSTATIC LOAD THROUGH BALANCING THE AUTONOMICS
  2. IMPROVING BIOMECHANICAL EFFICIENCY
  3. REDUCING POSTURAL STRAIN
  4. IMPROVING BIOMECHANICS OF RESPIRATION
  5. REMOVING OBSTRUCTIONS TO FLUID TRANSFER AND DRAINAGE
  6. AUGMENTING FLUID FLOW

IN CONCLUSION...

• DECISIONS ON DOSE AND FREQUENCY OF TREATMENT SHOULD ALWAYS BE BASED ON PATIENT TOLERANCE/REACTION.
• THE APPROPRIATE AND JUDICIOUS USE OF OMT PROCEDURES IN CONCUSSION AND C-SPINE INJURY WILL CALM/BALANCE THE COGNITIVE, SOMATIC, BEHAVIORAL, AND CIRCADIAN SYSTEMS OF THE BODY.
• THIS WILL OPTIMIZE TISSUE HEALING AND INCREASE THE PATIENT’S PHYSIOLOGIC HOMEOSTATIC RESERVES, HELPING TO MAXIMIZE HEALING EFFICIENCY.
IN CONCLUSION

"IT IS IMPORTANT TO REASON OUT THE PHILOSOPHY OF OUR SYSTEM OF TREATMENT. TRUE THERAPEUTICS MUST BE SCIENTIFIC AND PHILOSOPHIC. IN SAYING THIS, WE MEAN THAT THERAPY MUST CONFORM TO THE SCIENCE OF THE STRUCTURE AND FUNCTIONS OF THE ORGANISM AND TO THE PHILOSOPHY OF VITALITY REVEALED IN THE VITAL MECHANISM AND ITS LIFE PHENOMENA."

J.M. LITTLEJOHN
(D SCI OSTEOPATH, 1902-03, 3(6):258-277)

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