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Perspective

Nutritional Angle On The Tempero Mandibular Joint (TMJ)

André Hedger*

AJ Hedger and Associates, Great Bookham, Surrey, United Kingdom

***Corresponding Author:** André Hedger, AJ Hedger and Associates, Great Bookham, Surrey, United Kingdom.

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On a trawl of research papers from the last 20 years I have uncovered the following subjects, which have a nutritional angle on the temporomandibular joint TMJ:

- Reduced cartilage and affected ligaments
- Reduced bone condyle density
- Malocclusions
- Increased Electromyographic readings (EMG) and bruxism
- Increased free radicals in bilaminar zone
- Hormonal effects increase (TMD) cyclically in females
- Tinnitus
- Increased psychological problems compared with average
- Increased incidence in females
- Increased incidence with age
- Increased TMD with a soft diet
- Reduced nutrition intake
- Reduced vitamin levels
- Unilateral chewers
- Atypical swallowers increased TMD
- Increased 5HT and Serotonin levels in joint space
- Increased *Chlamydia* in females.

All of the suggested nutritional and dietary supplements are used to support the healing TMJ in those patients who are having conventional TMJ therapy to achieve the correct condyle/fossa relationship. All effects reported have research papers to validate the arguments.

Cartilage

Research

- Research shows an increase in Chondroitin 5 and Chondroitin 6 in joint space in TMD Sulphate. This demonstrates proteoglycan degradation in TMJ.
- Research shows an increase in glycosaminoglycans in TMD.
- Research shows a reduced thickness of condyle cartilage with a soft diet.
- Research shows a 35% reduction in chondroblasts in rats.
- Research shows that arthritic cartilage has one third of the sulphur of normal cartilage.

Comment: In the west the diet is very low in cartilage and gristle and has a correspondingly high incidence of osteoarthritis. In primitive countries and poorer nations the population eats more cartilage (e.g. In Yemen local fishermen eat the cartilaginous spines and vertebrae's of fish and all of the spare rib including the bones of the local desert goats).

Nutrition glucosamine sulphate (2250 mg per day)

Research shows that this can increase growth of the cartilage. It is a precursor for the formation of proteoglycans. When absorbed the Sulphur is split off from the Glucosamine and in itself is a valuable mineral.

There are over 300 investigations reported on Glucosamine Sulphate and 20 double blind trials. Several of the latter show Glucosamine Sulphate produces a better result in the reduction of pain than non-steroidal anti-inflammatory drugs (NSAID's) in people with arthritis. One paper shows that NSAID's accelerate the progress of osteoarthritis and speed up the breakdown of the cartilage.

Chondroitin sulphate

Not much evidence on the value of this. It is not absorbed by the body very well compared with the 98% absorption of the water soluble Glucosamine Sulphate.

Methyl sulphonyl methane (MSM)

This on its own is one of the most valuable minerals for healthy cellular activity. Some of the value of Glucosamine Sulphate may come from the Sulphur element, as there are few good research results with Glucosamine Hydrochloride.

Research shows a reduction of 82% in pain in patients with degenerative joint disease on MSM compared with 18% on a placebo.

Cetyl myristoleate

This has a lubricating effect on the joints and Dr. Atkins formerly from the New York Complimentary Medicine Clinic found this even more beneficial than Glucosamine Sulphate in osteoarthritic patients.

Ligaments

Comment: There are some nutrients specifically helpful for damaged tendons and ligaments.

Nutrition: Cats Claw (from the Peruvian Rainforest). This herb has been shown to be more effective in reducing back pain than long-term drug treatment in a German research paper from 1997. It has an anti-inflammatory effect, is high in antioxidants and reduces allergic reactions.

MSM (Methyl Sulphonyl Methane) 30 mg per day

Has been shown to reduce tennis elbow, carpal tunnel and Bursitis.

Condylar bone density

Often TMD patients have allergies and many are on restrictive diets in an attempt to help their malaise.

Due to intensive farming and use of inorganic fertilisers we now have a diet very deficient in minerals. There are over 70 minerals naturally occurring in soil but many of these are now quite depleted from the centuries of agriculture on the same land, intensive farming, poor crop rotation and from the modern overuse of inorganic fertilisers. The soil at Headley Farm, Leatherhead in Surrey (a mixed cereal and dairy farm near to where I work) is totally deficient in Selenium and Molybdenum. The animals raised there have to be given multimineral supplements just to survive.

We need 70 trace minerals and 11 rare earths to have optimal health.

Science has studies of some but not all of these minerals. We really only know the 'tip of the iceberg'.

For example, Selenium has clinically been shown that when given as a supplement it increases heart function and reduces the incidence of stroke.

Calcium is found in high concentrations in the blood and urine of patients with osteoporosis. Kidney stones and bony overgrowths are a common problem and yet this group are often advised to reduce their dairy and calcium intake, when it's quite clear that the opposite is required.

We need mineral supplementation to reduce the risks of heart disease, cancer, arthritis etc. and to increase our longevity.

There are four types of mineral supplements with differing absorbability rates by the gut:

A)	Metallic	20%	Approx. absorbed
B)	Chelated	45%	Approx. absorbed
C)	Bioavailable	80%	Approx. absorbed
D)	Colloidal	90%	Approx. absorbed

For optimal bone health we need the following minerals:

I	Calcium	(Ca)
II	Magnesium	(Mg)
III	Phosphorous	(Ph)
IV	Boron	(Bo)
V	Zinc	(Zn)
VI	Selenium	(Se)

These need to be in the right balanced proportions as if not managed correctly can have antagonistic effects against each other. TMD patients have less bone density than controls.

Nutrition

a) Ca, Mg, Zn orotate

b) Bioavailable Ca and Mg from kelp

c) Colloidal Multiminerals, rare earths and multivitamins.

Malocclusions

- Research shows a soft diet and a reduction in nutrition increases incidence of malocclusion in rats.
- Research shows that pigs fed on a soft diet develop retrognathic mandibles and malocclusions.

Nutrition

a) Healthy diet in childhood especially to eat hard foods e.g. Nuts, cereals, raw vegetables and food that requires chewing.

b) Eat a healthy and balance diet.

c) Restrict the use of dummy pacifiers and encourage breast feeding over bottle feeding as this causes a high vaulted narrow maxilla, increasing the fencing in of the mandible and increasing TMD.

Electromyographic (EMG) changes and bruxing

- Research shows an increase in EMG in TMD patients, increase in muscle mass, tetany and muscle scarring.
- Dr. Terry Sphal has shown some excellent human cadaver cryosections on the TMJ showing scarring of significant areas of the temporalis and lateral pterygoid in chronic TMD patients.

- Research on rats showed an increase in EMG when induced inflammation was created in the TMJ.
- Research shows a reduction but not elimination of bruxing in TMD treated cases.

Nutrition

a) Potassium (K) and Sodium (Na) are obvious important muscle minerals e.g. lack or depletion of Na and K produces muscle cramps.

b) Colloidal multiminerals and vitamins.

c) Antioxidants and super antioxidants.

Free Radicals

Research: Research shows that there are damaging free radicals (oxidative agents that are missing an electron) in the bilaminar zone.

Some of the free radicals found in TMD patients all of which cause pain are:

i) Hyaluronic acid

ii) Inflammatory cell cytokines

iii) Matrix degrading enzymes

iv) Neuropeptides

v) Arachidonic acid.

Research shows in a 1990 German paper that the Vitamins B1, B6 and B12 were significantly reduced in TMD patients versus controls.

Comment: The nutritional support is designed to increase the antioxidants, which help eliminate free radicals.

A. **Super Antioxidants:** These are called Oligomeric Phycocyanins (OPCs) and are derived from the Pine Bark Extract (Pycnogenol) or Grape seed extract. They are called super antioxidants, as they are twenty times more powerful than Vitamin C.

B. Vitamin C in optimal doses @ 2000 mg per day

C. Vitamin A @ optimal daily allowance (ODA)

D. Vitamin D3

E. Vitamin E @ ODA

F. Vitamin Q10 @ ODA

G. Multivitamins @ RNI (RDA)

H. Linoleic Acid (Flax seed oil @ 1000 mg/day).

Research shows that flax seed oil has important omega 3 fatty acids, which reduce prostaglandins and arachidonic acid in osteoarthritis. It also reduces pain in these cases. Other research shows omega 3 reduces depression, reduces migraines and pre-menstrual tension.

Boswellia (This comes from an Indian tree related to Frankincense). In Yemen local tribes use Frankincense to relieve joint pains by chewing on the resin. *Boswellia* has a powerful anti-inflammatory action and is very effective at reducing pain in osteoarthritis.

Hormonal effects

Research: Research shows TMD severity increases with the female menstruation cycle.

Comment: Some female hormones especially Lutenising Follicle Hormone (LFH) has an effect on softening ligaments of the TMJ disc and can increase the severity of TMD.

Nutrition: DHEA (Dehydroepiandrosterone).

This hormone stimulating animal extract which increases the body's own production including adrenal, oestrogen and testosterone as well as strengthening the body's immune system.

Comment: Some claim that DHEA increases longevity and reduces ageing and osteoporosis by increasing the body's own natural hormones. In males for example testosterone reduces with age, but by supplementing testosterone studies have shown that this increases longevity in animals.

N.B. DHEA is not available in the UK but is available in Europe and the USA.

Tinnitus

Comment: According to Dr. T. Sphal and his assessment of the research 100% of Tinnitus is linked with TMD.

Dr. B. Stack suggests in increasing the oxygenation of the blood using oxygen gas supplementation at night

Psychological

Research: In TMD patients the psychological problems are greater than average. Many papers report these effects.

Comment: I wonder which comes first the TMD or the psyche. The pain and debilitating effects of TMD are bound to increase depression profiles.

Nutrition: St. Johns Wort (Hypericin)

Is shown to be more effective in clinical trials than Prozac with only minimal side effects compared with the many of Prozac. Photophobia is the main reported side effect of St. Johns Wort although I have never had a patient report this. St. Johns Wort works best if taken for three months and then stopped, as it seems to have a lasting effect after cessation.

St. Johns Wort inhibits Serotonin uptake and was also shown to inhibit uptake of both Noradrenalin and Dopamine. In some ways it has a MAOI (mono-amine-oxidase-inhibitor) effect but it works on all three neurotransmitters. 60% of German GMP's (General Medical Practitioners) prescribe St. Johns Wort instead of any other anti-depressant.

Ginkgo Biloba

This has a significant effect on mood elevation and can be used in conjunction with St. Johns Wort if required.

Increased TMD in females

Research: Research shows that females have more frequent and varied TMD symptoms and more severe mandibular dysfunction than men.

In a survey in Sweden comparing TMD in elderly men with elderly women the females felt more lonely, often lived alone and felt more ill.

Research also shows that women have more of an unsatisfactory dietary intake compared with men.

Comment: In females the significant issues are:

(i) Hormone cycle

(ii) Blood loss and low iron

(iii) Menopause

(iv) Increased incidence of osteoporosis

(v) Reduced oestrogen with age.

Nutrition: Additional supplements especially for females:

a) Soya Extract (fermented) has a phytoestrogenic effect and is one of the reasons that the incidence of breast cancer is so low in the Far East.

b) Iron (Fe) (supplements) there are now bioavailable Fe supplements which have a better absorbability and less side effects than Fe tablets. Organic red meat in small regular amounts have been shown to have the best Fe in the bio available form Ferritin and it also contains Vitamin B12 and Niacin as an added bonus.

c) Increase dietary intake and not to diet or be on a restrictive regime.

d) Evening Primrose Oil this omega 6 fatty acid has clinically been shown to be helpful in pre-menstrual and menopausal females.

e) Vitamin B Complex This would be over and above the baseline and multi-mineral and multi-mineral colloidal supplement.

Increased TMD with age

Research: Research shows that the adaptive capacity of the TMJ in rats reduces with age.

Comment: Often TMD which has been chronic for many years leads to perforations of the discs, adhesions, displacements, crepitus and osteoarthritic changes.

Pain can worsen in:

(i) Increased EMG activity and with increased stress.

(ii) With poor nutrition

(iii) With a reduced nutrition intake.

(iv) With hormonal decline in oestrogens and testosterone.

Nutrition: Nutritional support becomes more important with increasing age as the body's absorption of nutrients reduces with age. A sixty year old female absorbs 25% of the nutrients of a twenty year old.

DHEA has a place for the ageing patient as it slows the ageing process by increasing the body's natural production of hormones, which are declining significantly with age.

Increased TMD with a soft diet

Research

- Research shows that a soft diet versus a hard diet produces underdeveloped condyles and mandibles in mice. The form with function seems to apply.
- Research shows that in rats there are increased malocclusions and increased Class II overjets on animals fed on a soft diet compared with controls.
- Research from Japan in 2000 showed that people who habitually eat easily chewable food, will leads to a decline in resistance to trauma of the TMJ.

Comment: Malocclusions, underdeveloped mandibles, condyles and overjets increase the incidence of TMD in adults.

Nutrition: Increase hard foods in diet especially with young children, modern western diet is getting softer so to recommend foods with substance at as early an age as possible.

Reduced nutrition intake

Reference Nutrient Intakes (RNI) have replaced the Recommended Daily Allowances (RDA).

Research shows on a recent paper on micro nutrient food intake in the UK that there has been a major and significant decline in RNI's for many vitamins and minerals over the last ten years. The following are especially noteworthy:

Results		% reduction in males	% reduction in females
(i)	Vitamin A	33	33
(ii)	Vitamin B2	30	30
(iii)	Vitamin B6	6	22
(iv)	Folic Acid		50
(v)	Vitamin C	34	34
(vi)	Magnesium	42	72
(vii)	Copper	24	59
(viii)	Iodine	9	32
(ix)	Iron	12	89
(x)	Selenium	45	45
(xi)	Zinc	30	30
(xii)	Vitamin B12 (especially in Vegans)	?	?
(xii)	Calcium	25	48

Comment: These figures show females are significantly worse off than males. In female teenagers the difference is even greater due to the modern (junk food culture).

Nutrition: Multi-minerals and Multi-vitamins plus extra nutrients for age and sex already described.

Reduced vitamin levels in TMD patients

Research: Research shows in a study from Germany that TMD patients had a sub clinical vitamin deficiency of 65% of two or more vitamins especially:

(i) Vitamin A (Thiamin)

(ii) Vitamin B2 (Riboflavin)

(iii) Folic Acid.

When these vitamins were added to the patients diet there was some improvement in reduction of pain.

Nutrition: Multi-minerals and Multivitamins and extra nutrients for age and sex already described.

Unilateral chewers have increased TMD

Research: Research shows in a 1993 paper from the Archives of Cell Biology an increase in TMD in unilateral chewers confirmed by EMG studies on active muscles and hyperactivity on the dysfunctional side.

Nutrition

(a) Ensure a good balanced dental occlusion

(b) Increase micro nutrient uptake.

Atypical swallowers have increased TMD

Research: Research from Brazil in 2005 showed atypical swallowing increased the TMD but not parafunction.

5HT and serotonin

Research: Research shows in a 1999 Swedish Paper that there is an increase in 5HT (a Serotonin precursor) and Serotonin in the joint space of TMD patients compared with controls.

Comment: 5HT and Serotonin are significant mood elevators. If these are found extra cellularly in the joint space there must be some cellular depleting mechanism.

Nutrition: 5HTP supplements stimulate the body's own Serotonin production as well as converting into itself.

Research: 5HTP has major benefits on reducing depression, anxiety, obsessive compulsive disorder, appetite control, migraines and Fibromyalgia.

Research showed in a Spanish study that 5HTP was as effective at relieving migraines as the conventional migraine drug treatment.

Chlamydia found in TMD

Research

- Research showed in the Journal of Oral and Maxillofacial Surgery 1999 that 20% of biopsied damaged articular discs were found to have Chlamydia but only in the female patients.
- Non-apparent chlamydial infection in females may also explain the marked prevalence of TMD in this group.

Nutrition

(a) Colloidal Silver could possibly be of benefit as it has powerful anti-microbial effects.

(b) Echinacea another natural antibacterial and anti-viral herb.

No more ideas

In conclusion TMD patients would benefit from nutritional supplementation in all cases in conjunction with joint preserving procedures. The nutritional advice and possible supplementation should be tailored for each individual according to sex, age and severity of symptoms. Hair, blood and urine analysis can help with identifying some of the deficiencies and should be discussed in severe cases. Saliva hormone tests can easily be carried out.

Suggested nutritional supplements for:

1. Pre-menopausal females
   - (a) Colloidal multi-minerals with multi-vitamins @ RNI including rare earths and essential amino acids.
   - (b) Glucosamine Sulphate, Chondroitin sulphate 2250 mg per day.
   - (c) DHEA (Dehydroepiandrosterone) if hormonal effects, 25 mg per day.
   - (d) St. John's Wort 300 - 900 mg per day.
   - (e) OPC's (super antioxidants) e.g. Grape Seed Extract 30 mg per day.
   - (f) Vitamin C @ ODA 2000 mg in a day.
   - (g) Vitamin A (or beta carotene) 7,500 iu. per day
   - (h) Vitamin E 400 iu. (268 mg) per day
   - (i) Vitamin Q10 60 mg. per day with Flax Seed Oil (omega 3) 800 mg. per day.
   - (j) Fe supplements and to increase organic red meat especially if heavy menstrual cycle.
   - (k) Evening Primrose Oil (EPO) if pre-menstrual tension a problem 1000 mg. per day.
   - (l) Vitamin B complex.
   - (m) 5HTP if St. Johns Wort not effective.
   - (n) Colloidal Silver if *Chlamydia* present.
   - (o) Cetyl Myristoleate 500 mg. per day for 30 days.

(p) Boswellia anti-inflammatory (not to use Ibuprofen as it accelerates arthritis and delays bone healing)

2. Post-Menopausal Females (in addition to the younger female group)
   (a) Ca, Mg, and Zinc Orotate 250/250/100 mg. per day.
   (b) DHEA a further 25 mg per day.
   (c) Soy Extract
3. Males
   (a) Colloidal Multi-minerals, multivitamins including rare earths and amino acids.
   (b) Glucosamine sulphate, Chondroitin sulphate, Cats Claw and Boswellia.
   (c) Vitamins A, C, E and Selenium.
   (d) OPC's Pycnogenol
   (e) St. Johns Wort if depression present.
   (f) Extra Vitamin C @ 2000 mg.
   (g) Vitamin Q10 and Flax Seed Oil.

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