Use of Hylan G-F 20 for Viscosupplementation of the Temporomandibular Joint for the Management of Osteoarthritis: A Case Report

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Viscosupplementation is a relatively new treatment concept for restoring the normal rheologic properties of the osteoarthritic joint. It is most often used for the knee. This case report describes results that were achieved using viscosupplementation following conservative therapy for a patient with osteoarthritis of the temporomandibular joint. Further study in the use of these treatments is recommended.

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Osteoarthritis is a chronic degenerative condition of the temporomandibular joint (TMJ) accompanied by secondary inflammation (synovitis).[1] It is one of three categories of the classification of the rheumatic diseases of the TMJ.[2] These categories are *(1)* noninflammatory arthritis (osteoarthrosis), *(2)* osteoarthritis, and *(3)* polyarthritides. The disease is characterized by erosion of the articular cartilage surfaces and secondary bone formation (osteophytes).[3] Initially the changes may be considered as remodeling or adaptive changes. However, during a period of time, the reparative capacity of the joint may be exceeded, and the changes may be considered pathologic.[3–5]

The etiology of osteoarthritis is not completely understood. It appears to be related to age and local factors such as repetitive overloading of the TMJ.[3,6,7] Overloading of the TMJ may be associated with occlusal components such as loss of vertical support by the dentition.[6,7]

Clinically, patients with osteoarthritis of the TMJ may have some of the following features[1,3,8]:

1. Pain with function of the affected joint as a result of inflammation
2. Tenderness on palpation of the affected joint
3. Crepitus (crackling or grating sound in the joint when opening or closing)
4. Loss of range of motion and limitation of opening
5. Radiographic changes such as condyle flattening, osteophyte formation, and a narrowing of joint space

Patients afflicted with TMJ osteoarthritis may have no symptoms other than crepitus.[3]

Treatment of osteoarthritis normally includes medications,[9] physical therapy,[10,11] interocclusal device therapy,[3,12] occlusal treatment,[6,11–14] and surgery.[15] It has been recommended that in

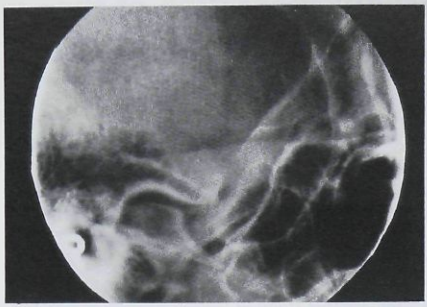

Fig 1 Transcranial radiograph of right TMJ reveals flattening and osteophyte formation of the condyle.

Fig 2 Transcranial radiograph of left TMJ reveals early erosive changes of the condyle.

the management of temporomandibular disorders (TMD), the basic principle of using conservative, reversible forms of therapy whenever possible should be followed.[16] Reversible modalities include physical therapy, pharmacologic agents, and interocclusal devices.[16] If the conservative modalities fail to provide the desired amount of relief from the signs and symptoms of osteoarthritis of the TMJ, further treatment modalities may be employed. Other modalities include injection of a corticosteroid into the TMJ and surgical procedures such as arthroscopy and open joint surgery.[2]

Viscosupplementation is a new treatment modality for osteoarthritis, and it has been used primarily for treatment of the knee.[17–21] The basis for management by this modality is that in osteoarthritis, the synovial fluid of the affected joint is more abundant and less viscous than that of the unaffected joint.[17,18] In arthritic joints, there is a decrease in interaction of the hyaluronan molecules. There also is a decrease in the hyaluronan concentration in the joint, often because of excess water of the synovial fluid resulting from synovitis. These changes cause the synovial fluid to have reduced protective physiologic effects such as shock absorption and lubrication.[17] Viscosupplementation is used in attempts to restore these protective effects of synovial fluid by returning the hyaluronic acid to normal molecular weight and concentration.[22,23]

Case Report

A woman aged 52 years presented with a chief complaint of pain, tinnitus, and blockage of her left ear. The patient's family physician referred her to an otolaryngologist for evaluation. The otolaryngologist examined her for a possible acoustic neuroma; however, magnetic resonance imaging revealed no evidence of pathology. Two other otolaryngologists were consulted, and they also found no pathology. The patient was referred for evaluation of her TMJs.

The patient's medical history was not remarkable. A complete screening and clinical examination of the patient's stomatognathic system was performed, and it revealed severe crepitation of the left and right TMJs. Palpation revealed painful left and right TMJs, temporal muscles, and sternocleidomastoid muscles. The maximum opening was 40 mm. Lateral excursive movements were 12 mm to the right and 0 mm to the left. Referral to a dental radiologist for radiographic evaluation showed moderate to severe erosion of the TMJ articular surfaces and osteophyte formation of both TMJs (Figs 1 to 4). The diagnosis of the patient's condition was osteoarthritis of the TMJ: severe in the left TMJ and moderate in the right.

Conservative treatment initiated consisted of fabrication of a maxillary centric relation interocclusal device and short-term use of a nonsteroidal anti-inflammatory medication (25 mg of Voltaren [Geigy Pharmaceutical, Mississauga, Ontario, Canada] three times a day). The patient was monitored on a regular basis. The crepitation, the pain intensity, and the stuffiness in the ears were all reduced but not eliminated. After 3 weeks, the anti-inflammatory medication was discontinued. After 9 months of interocclusal device therapy, the patient was reevaluated. Although the patient's signs and symptoms were improved, palpation

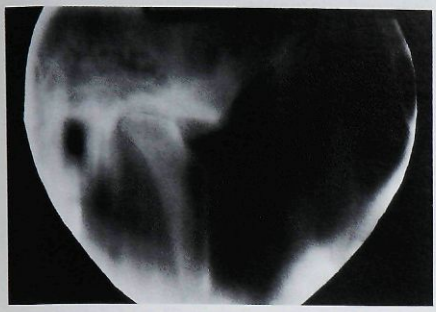

Fig 3 Tomograph of right TMJ shows severe erosive changes of the articular surface of the condyle.

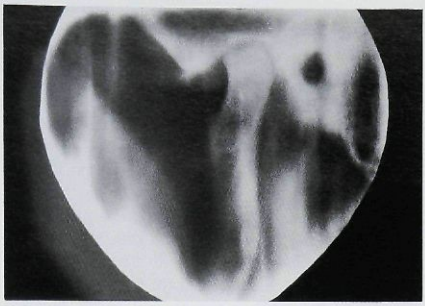

Fig 4 Tomograph of left TMJ shows moderate erosive changes of the articular surfaces of the condyle and early osteophyte formation.

revealed pain in the left TMJ—clinical evidence that inflammation was present in the left TMJ. The patient was informed about the use of a viscosupplement in her TMJ to attempt to reduce the inflammation in the TMJ. Informed consent was obtained for the treatment.

Initially, 1.8 mg of the local anesthetic bupivacaine hydrochloride was injected into the TMJ. Then, 1.0 mL of Synvisc (Hylan G-F 20, Biomatrix Canada, Pointe-Claire, Quebec, Canada) was injected into the superior joint space. An oral analgesic was prescribed for any postinjection sensitivity, and written and oral home care instructions were given. Two other injections into the superior joint space of both TMJs after the same regimen followed at 2-week intervals.

The initial injection was routine with very little postinjection sensitivity. Clinically, 7 days following the injection, crepitus from the TMJs was greatly reduced, and left lateral excursive movements were 10 mm (Prior to the injection they were 0 mm). The patient said that her TMJs felt better than they had in years.

The patient has continued to function well and has been comfortable 4 months after the series of injections. The patient has no discomfort, no tenderness to palpation, and a reduction in joint sounds in her TMJs.

Discussion

Hyaluron injections have been used previously to manage osteoarthritis of the knee.[17,20–26] The positive effects of the injections, as assessed by pain and function composite indexes, usually appear in a few days following the injection, and the benefits can last up to 1 year.[17] Clinical studies have shown that as many as six to 10 injections may be needed to achieve efficacy in management of osteoarthritis of the knee.[17] Compared to local injection with a corticosteroid, the effect of injection of a hyaluronan appears to last significantly longer.[26] In clinical trials with various preparations of hylan, it was found that multiple injections spaced 1 to 2 weeks apart are needed to achieve the desired therapeutic effect.[17,27,28] Excess hyaluronan is rapidly removed from the joint, and thus, multiple injections are required rather than one large bolus injection.[17] The joint may need several weeks with the presence of injected hyaluronan to achieve therapeutic benefits such as the return of normal production capacity of synovial fluid.[28]

Comparisons of hyaluronan products marketed for viscosupplementation have shown that Synvisc has superior rheologic properties compared to other products.[29] The criteria for the ideal viscosupplementation material are as follows[29]:

1. Tissue and blood compatibility
2. Permeability to metabolites and macromolecules
3. Proper rheologic properties, ie, rheologic properties should be restored to normal human synovial fluid
4. Slow export rate with a long half-life in the joint

Synvisc is a viscosupplementation material that fulfills all four of the criteria.[29]

Research has shown that the higher molecular weight preparations of hyaluronan have significant and long-lasting beneficial clinical effects.[30,31] Synvisc is a cross-linked hyaluronan.[27] The cross-

linking acts to increase the molecular weight, which increases the joint retention time.[27] Clinical trials have shown that Synvisc is effective in helping patients with osteoarthritis of the knee.[27]

It appears that injection of Synvisc has few side effects that appear to be localized to the injected joint, such as localized transient pain and swelling, which are easily resolved.[27] In case reports including the present one, there have been no adverse side effects reported. It seems at this point that hylan injections appear to have few, if any, systemic side effects.

In the patient with moderate to severe osteoarthritis of the TMJ in the present study, Synvisc was effective in further reducing signs and symptoms experienced following conservative management techniques. Other studies comparing sodium hyaluronate (Hylartil, Pharmacia AB, Uppsala, Sweden) and corticosteroid injection for both long- and short-term periods resulted in statistically similar results; it was concluded that sodium hyaluronate may be the better treatment alternative because of reduced side effects.[32,33] Other studies[34] have shown that sodium hyaluronate may be beneficial in the treatment of a displaced articular disc of the TMJ. This same study[34] also involved clinical trials with sodium hyaluronate in the treatment of osteoarthritis. The results showed no statistical difference between sodium hyaluronate and a placebo. The investigators used only a single injection of sodium hyaluronate, but other research has shown multiple injections are required in the management of osteoarthritis.[17,27,28,34]

This case report has shown that potential exists for the use of Synvisc in the management of TMJ osteoarthritis. Further clinical and experimental investigation is needed and is underway to establish treatment parameters and indications for Synvisc. Double-blind clinical comparative studies with the other treatment modalities are indicated to determine the most effective and benign treatment modality for osteoarthritis.

Conclusion

This case report follows the course of management of a patient with moderate to severe osteoarthritis. Initial treatment consisted of interocclusal devices and nonsteroidal anti-inflammatory medications. The signs and symptoms of the osteoarthritis were reduced as a result of this regimen. Injection of Synvisc into the TMJ reduced the clinical signs and symptoms of osteoarthritis for the 4-month follow-up period to date.

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References

1. American Academy of Orofacial Pain. McNeil C (ed). Temporomandibular Disorders. Guidelines for Classification, Assessment, and Management. Chicago: Quintessence, 1993:51.
2. Carlsson GE, Kopp S, Oberg T. Arthritis and allied diseases. In: Zarb GA, Carlsson GE (eds). Temporomandibular Joint Function and Dysfunction. Copenhagen: Munksgaard, 1979:269–320.
3. Kaplan AS, Buchbinder D. Arthritis. In: Kaplan AS, Assael LA (eds). Temporomandibular Disorders. Philadelphia, PA: Saunders, 1991:165–167.
4. Kreutziger K, Mahan P. Temporomandibular degenerative joint disease. Oral Surg Oral Med Oral Pathol 1975;40: 165–182.
5. Solberg W. TMJ disorders: Clinical significance of TMJ changes. Br Dent J 1986;160:231–236.
6. Christensen LV, Ziebert GJ. Effects of experimental loss of teeth in the temporomandibular joint. J Oral Rehabil 1986;13:587–598.
7. Taddei C, Frank RM, Cahen PM. Effects of complete denture wearing on temporomandibular joints: A histomorphometric study. J Prosthet Dent 1991;65:692–698.
8. Berrett A. Radiology of the temporomandibular joint. Dent Clin North Am 1983;27:527–540.
9. Yustin D. Pharmacological management of craniomandibular disorders. Ont Dent 1993;70:17–22.
10. Rocabado M. Arthrokinematics of the temporomandibular joint. Dent Clin North Am 1983;27:573–594.
11. Kopp S. Diagnosis and non-surgical treatment of the arthritides. In: Sarnat BG, Laskin DM (eds). The Temporomandibular Joint: A Biological Basis for Clinical Practice. Philadelphia, PA: Saunders 1992:357–381.
12. Wilkinson T, Hansson TL, McNeill C, Marcel T. A comparison of success of 24-hour occlusal splint therapy versus nocturnal occlusal splint therapy in reducing craniomandibular disorders. J Craniomandib Disord Facial Oral Pain 1992;6:64–70.
13. Wenneberg B, Kopp S, Grondahl HG. Long-term effect of intra-articular injections of a glucocorticoid into the TMJ: A clinical and radiographic 8-year follow-up. J Craniomandib Disord Facial Oral Pain 1991;5:11–18.
14. Barghi N, dos Santos J, Narendran S. Effects of posterior tooth replacement on temporomandibular joint sounds: A preliminary report. J Prosthet Dent 1992;68:132–136.
15. McCain JP, Sanders B, Koslin MG, Quinn JD, Peters P, Indressano AT. Temporomandibular joint arthroscopy: A 6 year multicenter retrospective study of 4831 joints. J Oral Maxillofac Surg 1992;50:926–930.
16. Griffiths RH. The President's Conference on the Examination, Diagnosis and Management of Temporomandibular Disorders. Chicago: American Dental Association, 1982:183.
17. Peyron JG. Intra-articular hyaluronan injections in the treatment of osteoarthrisits: State-of-the-art review. J Rheumatol 1993;20(suppl 39):10–15.

18. Adams ME. An analysis of clinical studies of the use of crosslinked hyaluronan, Hylan in the treatment of OA. J Rheumatol 1993;29(suppl 39):16–19.
19. Peyron JG, Balazs EA. Preliminary clinical assessment of Na-hyaluronate injection into human arthritic joints. Pathol Biol (Paris) 1976;22:731–736.
20. Weiss C, Balazs EA, St Onge R, Denlinger JL. Clinical studies of the intra-articular injections of Healon (sodium hyaluronate) in the treatment of osteoarthritis of human knees. Semin Arthritis Rheum 1981;11:143–144.
21. Namiki O, Toyoshima H, Morisaki N. Therapeutic effect of intra-articular injection of high molecular weight hyaluronic acid on osteoarthritis of the knee. Int J Clin Pharmacol Ther Toxicol 1982;20:501–507.
22. Balazs EA. The physical properties of synovial fluid and the special role of hyaluronic acid. In: Helfet A (ed). Disorders of the Knee. Philadelphia, PA: Lippincott, 1974:61–74.
23. Balazs EA, Denlinger JL. Viscosupplementation: A new concept in the treatment of osteoarthritis. J Rheumatol 1993;20:3–9.
24. Oshima Y. Intra-articular injection therapy of high molecular weight sodium hyaluraonate on osteoarthritis of the knee joint. Phase II clinical study. Jpn Pharmacol Ther 1983;11:2253–2257.
25. Dixon ASJ, Jacoby RK, Berry H, Hamilton EBD. Clinical trial of intra-articular injection of sodium hyaluronate in patients with osteoarthritis of the knee. Curr Med Res Opin 1988;11:205–213.
26. Leardini G, Mattra L, Franceschini M, Perbellini A. Intra-articular treatment of knee osteoarthritis. A comparative study between hyaluronic acid and 6-methyl prednisolone acetate. Clin Exp Rheumatol 1991;9:375–381.
27. Adams ME. An analysis of clinical studies of the use of crosslinked hyaluronan, hylan, in the treatment of osteoarthritis. J Rheumatol 1993;20:16–18.
28. Balasz EA, Denlinger JL. The role of hyaluronic acid in arthritis and its therapeutic use. In: Peyron JG (ed). Osteoarthritis: Current Clinical and Fundamental Problems. Paris: Geigy, 1985:165-174.
29. Balasz EA, Denlinger JL. Viscosupplementation: A new concept in the treatment of osteoarthritis. J Rheumatol 1993;20(suppl 39):3–9.
30. Russell IJ, Michalek JB, Lawrence VA, Lessap DJA, Briggs BT, May GS. A randomized, placebo and non-intervention controlled trial of intra-articular 1% sodium hyaluronate in the treatment of knee osteoarthritis [abstract]. Arthritis Rheum 1992;35:94.
31. Isdale AH, Hordon LD, Bird HA, Wright V. Intra-articular hyaluronate (Healon): A dose ranging study in rheumatoid arthritis and osteoarthritis. J Drug Dev 1991; 2:93–99.
32. Kopp S, Wenneberg B, Haraldson T, Carlsson GE. The short-term effect of intra-articular injections of sodium hyaluronate and corticosteroid on temporomandibular joint pain and dysfunction. J Oral Maxillofac Surg 1985;43:429–435.
33. Kopp S, Carlsson GE, Haraldson T, Wenneberg B. Long-term effect of intra-articular injections of sodium hyaluronate and corticosteroid on temporomandibular joint arthritis. J Oral Maxillofac Surg 1987;45:929–935.
34. Bertolami CN, Clark GT, Rendell J, Shetty V, Changrui L, Swann P. Use of sodium hyaluronate in treating temporomandibular joint disorders: A randomized, double blind, placebo-controlled clinical trial. J Oral Maxillofac Surg 1993;51:232–242.

Resumen

La utilización del Hylan G-F 20 para el viscosuplemento de la articulación temporomandibular en el manejo de la osteoartritis: Reporte de un caso

El viscosuplemento es un tratamiento relativamente nuevo para restaurar las propiedades reológicas de la articulación osteoartrítica. Es utilizado mas a menudo para la rodilla. Este reporte describe los resultados que se consiguieron utilizando el viscosuplemento luego de la terapia conservadora recibida por un paciente con osteoartritis de la articulación temporomandibular. Se recomiendan mas estudios sobre el uso de estos tratamientos.

Zusammenfassung

Der Gebrauch von Hylan G-F 20 zur Viscosupplementation des Kiefergelenkes in der Therapie von Arthrose: Ein Fallbeispiel

Viscosupplementation ist ein relativ neues Behandlungskonzept zur Wiederherstellung der normalen rheologischen Eigenschaften eines arthrotischen Gelenkes. Sie wird häufig am Knie angewandt. Dieses Fallbeispiel zeigt die Resultate, die mit Viscosupplementation im Anschluss an konservative Therapie bei einem Patienten mit Arthrose des Kiefergelenkes erreicht werden konnten. Weitere Studien über die Anwendung dieser Behandlung sind notwendig.