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A Novel Technique for the management of AtlantoAxial OsteoArthritis (AAOA)

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Abstract

Purpose: This study presents a conservative approach and a novel technique for managing Atlantoaxial Osteoarthritis (AAOA). The subaxial cervical joints have a five joint complex, while C1-C2 joint is a three joint structure which makes it undergo biomechnaically increased stress. Atlantoaxial Osteoarthritis (AAOA) is more commonly associated with the elderly age group, especially women. Most of these patients improve with conservative treatment, while few require surgical fixation.

Materials and Methods: Three hundred thirty-eight patients were analysed from the database (2009 to 2018) with a minimum follow up of 18 months. All patients presented with unilateral sub-occipital neuralgia, unilateral restricted movement, C2 radiculopathy and no myelopathy. Diagnosis of AAOA with an open mouth AP radiograph is confirmatory. Dynamic radiographs were used to diagnose instability. CT Scan was done for pre-operative evaluation, and MRI was done to rule out sinister pathologies.

Results: The average age of the patients was 65.2 years (41-84 years). The majority of the patients (177) were females working as housewives. Our study didn't have any correlation with the lifting of heavy objects on the head. The majority of the patients were treated conservatively with a soft cervical collar, and they were asked to wear it throughout the day and night, every day for two months. Patients with no symptomatic relief after conservative treatment with collar were given an intra-articular injection or greater occipital nerve block (BR Dave's Technique). Patients not responding to conservative management with persistent instability were treated with Surgical Fixation (Trans-articular/Harms-Goel).

Conclusion: The primary management is with a cervical collar; Greater Occipital Nerve Block (BR Dave's technique) or Intra-articular block provides excellent symptomatic relief.

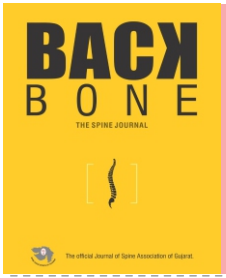
Key words: Arthritis, Atlantoaxial, Nerve block, C1C2 instability, C1C2 fusion

Introduction

The first cervical vertebra, the atlas, supports the head. It is unique as it doesn't have a centrum, which is occupied by the odontoid/dens. The atlas has two lateral masses connected by an anterior (shorter) and a posterior (longer) arch. The transverse ligament keeps the dens close to the anterior arch. The second cervical vertebra, the axis, acts as an axle for the atlas and head to rotate around the odontoid process, which projects cranially from the upper and anterior surface of the body. The odontoid has a conical shape and a mean length of 15 mm in adults. It may be tilted to 14° posteriorly or anteriorly on the body of the second cervical vertebrae. The dens may also tilt laterally up to 10°.[1]

The C1-C2 joint is a three-joint complex comprising of two facet joints and one atlanto-odontoid joint. The sub-axial cervical spine makes a five-joint complex, including the two facet joints, two uncovertebral joints and one intervertebral disc. Biomechanically the atlantoaxial joint undergoes increased stress. The cervical spine undergoes degeneration at both synovial articulations (Osteoarthritis) and cartilaginous disc joints (Osteochondrosis). The ventral rami of C2 innervate the Lateral Atlanto-axial joints.[2]

Atlantoaxial Osteoarthritis is degenerative arthritis, known to occur amongst the elderly age group. Unilateral atlantoaxial joints are more commonly involved and patients present with unilateral sub-occipital neuralgia, unilateral restricted neck



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movement and neck muscle spasm. Diagnosis with the help of clinical findings, dynamic radiographs and open mouth view is an efficient way of managing this ailment. This paper aims to highlight the importance of conservative management and discuss a novel technique for the management of Atlantoaxial Osteoarthritis (AAOA).

Materials and Methods

Between 2009 and 2018, 338 patients diagnosed with Atlantoaxial Osteoarthritis (AAOA) using clinical findings, dynamic radiographs and open mouth view radiographs were enrolled for the study. The patients were followed up for a minimum of 18 months. Ethics committee approval was obtained from Stavya Spine Hospital and Research Institute Ethics Committee and registered with Clinical Trial Registry India (CTRI/2021/04/032985).

Criteria for Inclusion

Patients included in the study belong to the age group 40 to 90 years, were diagnosed as having AAOA on open mouth view X-ray. Those patients willing to give consent and participate in the study, mentally, and physically able to comply with the study protocols, including completing forms and other study procedures were included. Signed and dated informed consent document were taken before any procedures were performed, indicating that the patient was informed of all aspects of the study.

Criteria for exclusion

Patients not willing to participate in the study or not ready to sign the consent form were excluded. Patients with a history of Rheumatoid Arthritis (RA) or any related inflammatory disorders, tumours, infections or surgery at the craniovertebral junction were also excluded.

Neurological examination was performed in all the patients, who presented with unilateral occipital neuralgia and unilateral restricted neck range of motion. We correlated the patient's occupation (heavy weight lifting on the head) with pain. Open mouth view and dynamic lateral views obtained for evaluating the C1-C2 Joints, which revealed reduced joint space and subluxation. MRI for sinister pathologies and a CT scan for operative management. We did not attempt to interpret degenerative changes at the atlanto-odontoid joint, but the dens was grossly normal in all the cases.

Patients with no instability or reducible instability were managed with a soft cervical collar, to be worn for as many hours in the day and night as possible, every day for two months. In patients with no pain relief and no instability, Intra-articular facet block or Greater Occipital Nerve Block was given. The intra-articular block was given in a prone position and open mouth under fluoroscopy guidance. 1 ml, 40 mg triamcinolone and 1ml, 0.25% Sensorcaine was injected intra-articular and periarticular. In patients with no pain relief and persistent instability, surgical fusion was done, using Trans-articular or Goel-Harm's Fusion.

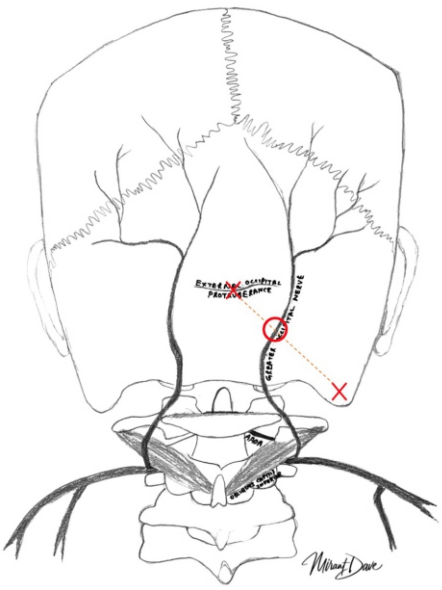

Figure 1: The greater occipital nerve block, in a patient with atlantoaxial osteoarthritis, can be given at the point of tenderness, on the affected side. An imaginary line is drawn, joining the greater occipital protuberance and the mastoid process. The injection is administered at a point 2 cm lateral to the greater occipital protuberance.

BR Dave's AAOA nerve block technique

The use of this technique for AAOA has not been highlighted in the literature. This technique followed by the senior author involves, injecting a cocktail of 1 ml, 0.5 % Sensorcaine, with 40 mg Triamcinolone, over the Greater occipital nerve, around 2 cm away from the midline, over the site of tenderness, on the painful side. An imaginary line is drawn from the greater occipital protuberance up to the mastoid (Fig.1). A point 2 cm lateral to the occipital protuberance is identified and the cocktail is injected. The technique involves injecting into the deep layer, touching the periosteum. This technique is performed on an outpatient basis, with aseptic precautions in a sterile atmosphere.

Results

In our study, majority patients were females (177) having ADL associated with the activities as housewives. 161 patients were males. The average age of the patients was 65.2 years (41 to 84). We found no correlation with occupations like lifting heavy weight on the head (as with Indian lifestyle), and they did not correlate with arthritis and pain. Two hundred eighty-nine patients had an excellent outcome with the cervical collar only, while 43 patients had no pain relief and 3 patients had partial pain relief. All patients in the study were counselled to wear the soft cervical collar for as many hours as possible during the day

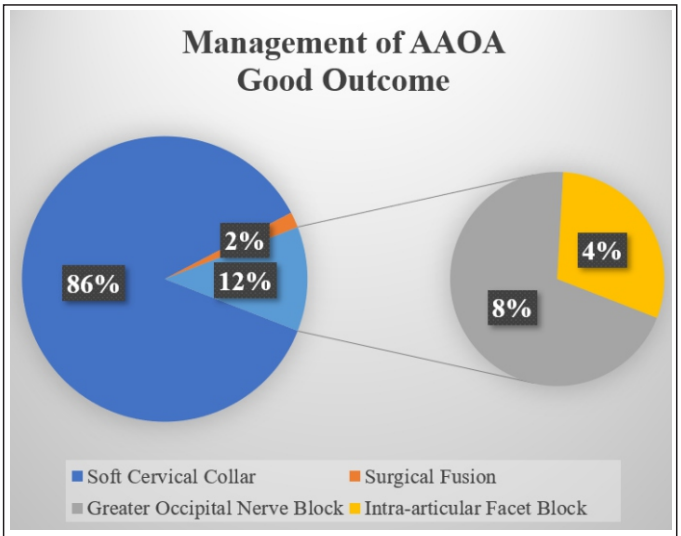

Figure 2: 86.4% of the patients has good pain relief with soft cervical collar only. 11.8% of our study group required nerve/facet block. Only 1.77% of our patients in this study required surgical fusion.

and night. We observed patients had good compliance after few days of pain relief with immobilisation and were advised to wear it for at least 2 months.

Out of the 46 patients with partial or no pain relief, 40 patients were managed with local cocktail injection. Six patients were treated surgically due to persistent instability and pain.

Out of the 40 patients treated with cocktail injection, 12 patients were given a cocktail injection intra-articular, while 28 patients were managed with the greater occipital nerve block. Twenty-eight patients (4 from the intra-articular group and ten from the greater occipital group) had good symptomatic relief. A second injection was required for 5 of the patients in this study. Only six patients underwent surgical management in the form of fusion (3 Harms/Goel Fusion and 3 Transarticular) for persistent instability.

We observed symptomatic relief in 86.4% of the patients with the cervical collar only (Fig. 2). A few of the patients with post-treatment CT Scans showed auto-fusion of the joint, which points to the self-limiting nature of this condition and good pain relief in patients who had good compliance with the soft cervical collar.

Discussion

Atlantoaxial Osteoarthritis is more commonly found in the elderly age group. AAOA is radiologically classified into three types, atlanto-odontoid, lateral atlantoaxial, and mixed type.[3] It can cause severe unilateral neck spasm and unilateral occipital neuralgia.[4] Instability may be present, but if reducible, it should be managed conservatively. The prevalence of AAOA ranges from 18.2% in the ninth decade to 5.4% in the sixth decade.[5] Halla and Hardin (1987) found 4% of the population with peripheral OA or Degenerative Joint Disease of the Spine, had findings of C1-C2 facet joint arthritis. Most

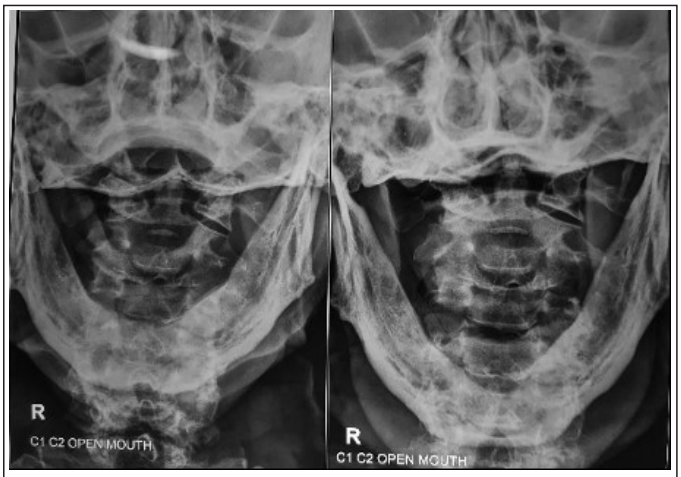

Figure 3: Radiography showing degenerative changes in the lateral atlantoaxial joint, suggestive of atlantoaxial osteoarthritis.

Figure 4: Dynamic flexion, extension radiographs showing no instability at the C1-C2 joint.

patients were females (74%) presenting with unilateral joint arthritis (76%).[6] Our database also revealed two patients referred by a physician to a psychiatrist for their severe occipital pain and restricted neck movement. In our study, we did not find any patients with bilateral atlantoaxial joint involvement.

Patients with clinical symptoms of AAOA are to be evaluated with Open Mouth Radiographs (Fig. 3) and Dynamic Lateral Radiographs (Fig. 4). Mixter and Osgood, in 1910, described the importance of open mouth radiographs for visualization of the upper cervical spine. They also mentioned case reports of asymmetry of the Atlanto-Axial Joints due to trauma, open mouth views and relief of symptoms with a Thomas Collar.[7] In our study, the large sample size led us to research soft cervical collar immobilization effectiveness for 22-23 hours as an effective management technique for 86.4 % of the patients. Most patients had non-compliance for the hard cervical collar, hence a soft cervical collar (with plastic inside, readily available) was advised. All patients had severe pain and spasm, which was relieved by the soft collar, giving comfort to the patients, which led to wide acceptance in all patients, hence the soft collar was advised to be continued for 2 months. Patients

with reducible instability can also be managed with a soft cervical collar.

Patients with no pain relief and instability can be managed with Intra-articular Facet Block or BR Dave's Technique (Greater Occipital Nerve Block). In our study, patients in the initial study group were offered Intra-articular blocks. Harata, Tohno and Kawagishi, in 1982, first reported accidentally that the patient had pain relief due to intra-articular injection of Xylocaine when they were testing for pre-operative pain induced by saline injection in the joint. They also noted histological bone sclerosis, intra-cartilaginous ossification and cellular infiltration in Atlanto-Axial joints, indicating arthritis.[8] Dreyfuss et al. in 1994 showed that degenerative arthritis of the upper cervical spine can manifest as suboccipital pain raditing to the neck or behind the ears. Injecting normal saline over the atlanto-occipital and atlantoaxial joints results in a pain along the neck and suboccipital region.[9] C. Aprill et al. demonstrated the efficacy of intra-articular nerve root blocks to be 60%.[10] Robert E. et al. described a meta-analysis for conservative treatment of AAOA. Conservative options include nonsteroidal anti-inflammatory drugs (NSAIDs), intra-articular facet injections, cervical collar/bracing, physical therapy, cervical traction, and C2 nerve blocks.[11] Falco et al. reported evidence using blocks to diagnose facet-mediated pain and therapeutic cervical medial branch blocks. However, they noted a lack of evidence for intra-articular injections.[12] In a randomized, controlled trial of 120 patients with facet joint-mediated neck pain treated with injections, more than 83% of patients had 50% or greater pain relief for up to 1 year.[13] Narouze et al. presented a study on intra-articular blocks had short-term relief in 81% of patients, but the effects diminished by 6 months.[14] Glemarec et al. treated 26 patients with atlantoaxial osteoarthritis with intra-articular steroid injections, 10 of whom had inflammatory disorders, and 16 had mechanical disorders. The response rate was significantly better in patients with inflammatory disorders.[15] All our patients in this study had degenerative arthritis and responded with near-complete pain relief to nerve block/facet block. Almost all authors working on this subject have pointed out the lack of adequate research on this subject.

Intra-articular nerve root block can be a promising technique as a second-line treatment. But the technique is cumbersome, as this joint is difficult to locate under fluoroscopy and requires multiple shots on the c-arm. Initial patients in the study group were offered intraarticular injection, but due to the risk of complications and a need for fluoroscopy, this technique was discontinued. Patients were offered BR Dave's Nerve Block (greater occipital nerve block) technique for AAOA, demonstrating equivalent outcomes.

Greater Occipital Nerve Block has been used for primary (cluster headache, migraine, and nummular headache) and secondary headaches (cervicogenic headache and headache attributed to craniotomy), also used in cranial neuralgias (occipital neuralgias, glossopharyngeal and trigeminal neuropathies).[16] But the use in Atlantoaxial Osteoarthritis has not been mentioned as a treatment option in the literature. This technique has a short learning curve, can be done without fluoroscopy, and minimal or no complications except drug sensitivity. Literature mentions alopecia and other mild complications, but we encountered no complications, as we penetrated the deep tissue and injected the cocktail touching the periosteum.

We observed long term relief of symptoms in the majority of the patients with conservative management. CT Scans done in few patients, 18 months follow up without surgery, showed auto fusion of the lateral atlantoaxial joints and explained complete relief of symptoms (Fig. 5).

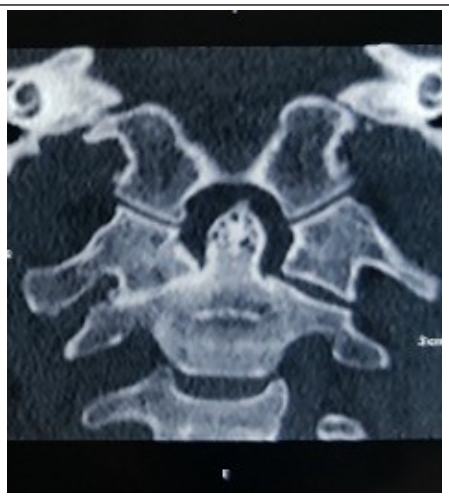

Figure 5: Computed Tomography showed autofusion of the lateral atlantoaxial joint at 18 months follow-up, without surgical intervention.

Figure 6: First-line treatment for atlantoaxial osteoarthritisis a soft cervical collar. second-line management includes nerve block/Facet block (no pain relief) and surgical fusion (persistent instability).

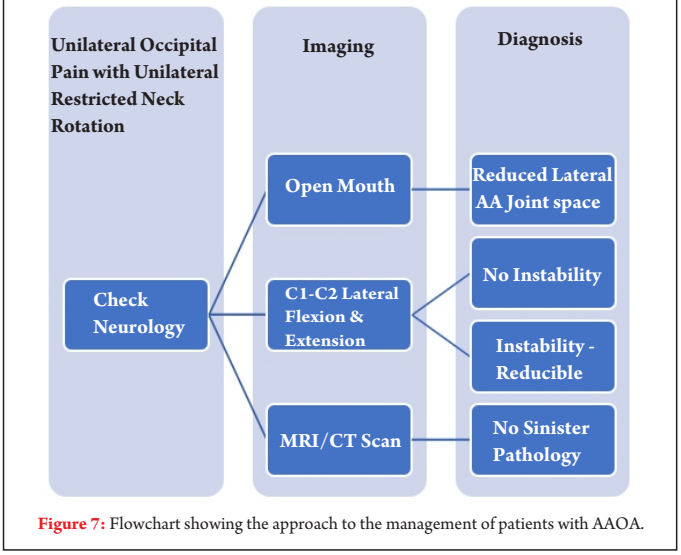

Figure 7: Flowchart showing the approach to the management of patients with AAOA.

All patients in the study with reducible subluxation were advised soft cervical collar. Patients who presented with persistent instability at follow-up and no pain relief were advised surgical fusion. Surgical intervention (Trans articular or Goel-Harms Fusion) was done, only for patients, not

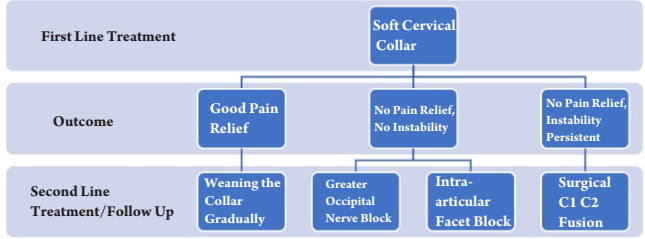

Figure 8: Flowchart showing the management of a patient with AAOA.

responding to conservative management and significant instability or sinister pathologies (Fig.6).

Conclusion

Atlantoaxial Osteoarthritis is a condition to look for in the geriatric age group. The primary management is non-surgical treatment with cervical collar, followed by Greater Occipital Nerve Block (BR Dave's technique) or Intra-articular block which provides excellent symptomatic relief.

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Declaration of patient consent: The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his consent for his images and other clinical information to be reported in the Journal. The patient understands that his name and initials will not be published, and due efforts will be made to conceal his identity, but anonymity cannot be guaranteed.

Conflict of Interest: NIL
Source of Support: NIL

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