

# Complications of Diagnostic TMJ Arthroscopy: An Institutional Study

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## Abstract

**Introduction** The prevalence of using arthroscopy for the diagnosis of the TMJ disorders is increasing due to its superiority to conventional methods of imaging. Although considered to be safe, complications do occur.

**Patients and Method** A single operator single-institution retrospective study consisting of 50 patients taken up for diagnostic arthroscopy was analysed for complications.

**Results** Lacerations of external acoustic meatus was found in 03 patients (6%); immediate partial hearing loss was seen in 01 patient (2%); transient facial nerve palsy was found in 05 patients (10%); sensory disturbances over the distribution of auriculotemporal nerve was evident in 01 patient (2%); haemorrhage as visualised by excessive bleeding through trocar skin puncture wound was seen in 05 patients (5%). Post-operative pain more than the pre-operative pain on assessment by visual analogue scale was noted in 05 patients (10%) on the immediate post-operative day. Reduction in spontaneous mouth opening was noted in 15 patients (30%).

**Conclusion** Though the complication rate was found to be higher than most of the other studies, they were minor which resolved without any intervention. The cases with complications were clustered at the beginning of the series which suggests the steep learning curve and the importance of surgeons' experience and skill involved in this procedure.

**Keywords** TMJ arthroscopy · Complications · Level I Arthroscopy

## Introduction

TMJ internal derangement is a generalised term that includes any disorder that interferes with the smooth functioning of TMJ [1]. Those conditions which are characterised by abnormal relationship of the disc to the condyle are referred to as disc derangements [2]. Accurate diagnosis of intra-articular temporomandibular joint disorders can be carried out with the use of magnetic resonance imaging (MRI). Currently, this imaging modality is considered as the most advanced imaging modality of TMJ. Being non-invasive with virtually no exposure to ionising radiation, high-quality images can be obtained in any plane to ascertain the position of the disc in relation to the condyle [3]. Arthroscopy, a minimally invasive surgical modality, can be used for accurate in vivo real-time diagnosis of intra-articular pathologies. Several studies have demonstrated superior sensitivity, specificity and accuracy of arthroscopic diagnosis than MRI [4]. Arthroscopy is probably the safest among all the procedures carried out by the maxillofacial surgeon [5]. Nevertheless, several complications have been reported in literature for the diagnostic arthroscopic procedures. Most of these complications are minor and short lived. Some of them may increase the morbidity; can be life threatening in rare instances requiring additional emergency surgical procedures [6–8].

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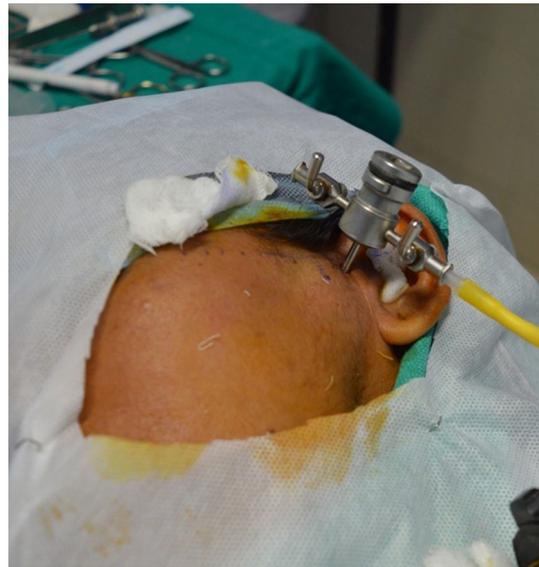
## Patients and Method

The study consisted of 50 patients (32 females and 18 males) diagnosed clinically and on MRI as TMJ internal derangement classified according to Wilkes criteria. All the patients had undergone non-surgical treatment for a period of at least 03 months with minimal or no improvement in symptoms. After obtaining written informed consent, these patients were taken up for diagnostic arthroscopy of TMJ. All the procedures were carried out by a single operator over a period of 08 months (May–Dec 2017) at the Division of Oral and Maxillofacial Surgery at the Dept of Dental Surgery and Oral Health Sciences at the Armed Forces Medical College, Pune, India. The surgical procedure was carried out under GA in 35 patients and under LA with auriculotemporal nerve block in 15 patients.

After administration of GA with nasoendotracheal intubation or after administration of auriculotemporal nerve block using 2% lignocaine and 1:80,000 adrenaline for patients taken up under LA, the superior joint space was distended with 2 mL of Ringer's lactate solution. Skin markings as described by Mc Cain et al. [20] was followed after marking the Holmlund Helsing line extending from the ipsilateral tragus to the lateral canthus of the eye (Fig. 1). The joint was entered using a sharp and blunt trocar in succession (Figs. 2, 3). The arthroscope was introduced inside the superior joint space for visualisation of the seven landmarks. Continuous irrigation of the joint space was ensured by establishing an outflow needle of 18 gauge size with an assistant pumping the Ringer's lactate solution. All the seven arthroscopic landmarks were visualised, and diagnosis was established in each case based on the appearance of the joint components. Diagnosis included anterior disc displacement with reduction (ADWR),



**Fig. 1** Markings for the insertion of arthroscope



**Fig. 2** Trocar in situ at the posterior point of penetration



**Fig. 3** Diagnostic arthroscopy assembly in situ with the outflow needle

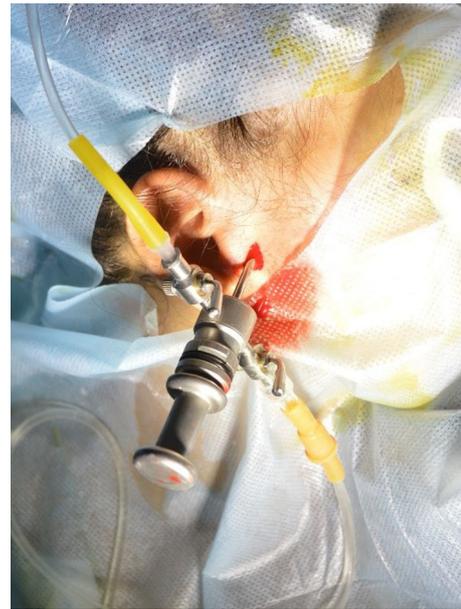
anterior disc displacement without reduction (ADNR), capsulitis, synovitis, retrodiscitis, adhesions, fibrosis of the joint space and various grades of chondromalacia. The intra-operative complications that were observed were noted. On the conclusion of the procedure, a single suture at the site of trocar insertion was placed if deemed necessary. Pressure dressing was applied preauricularly, and the patient was discharged with post-operative antibiotics of amoxicillin 500 mg and clavulanic acid 125 mg; analgesic combination of ibuprofen 400 mg and paracetamol 375 mg. All patients were reviewed on the next day and at intervals of 01 week for the next 01 month. Post-operative pain was measured using the visual analogue scale during the review visits. Post-operative physiotherapy was started after 24 h of surgery with the outcomes measured during the post-operative review.

## Results

All the possible complications that were enumerated in the literature were considered in our study. A total of 50 patients were taken up for the study with 32 females (64%) and 18 males (36%). Only unilateral cases have been considered in the study. The left TMJ was involved in 23 patients (46%), and the right TMJ was involved in 27 patients (54%). Thirty-five patients were treated under GA (70%), while 15 patients were treated under LA (30%). Lacerations of the external acoustic meatus were found in 03 patients (6%). One patient (2%) complained of reduced hearing immediately after the procedure which was restored to normal during a period of 01 month. Transient facial nerve palsy involving the temporal and the zygomatic branches were seen in 05 patients (10%), which completely resolved over a maximum period of 01 week (Fig. 4). Sensory disturbances over the distribution of auriculotemporal nerve were seen in 01 patient (2%). No cases of infection or clots in the external acoustic meatus were seen. Haemorrhage as visualised by excessive bleeding through the trocar skin puncture wound was seen in 05 patients (5%) (Fig. 5). Post-operative pain more than the pre-operative pain on assessment by visual analogue scale was noted in 05 patients (10%) on the immediate post-operative day. No patient perceived any pain due to procedure at the end of 01 week. Reduction in spontaneous mouth opening was noted in 15 patients (30%) which was restored to or more than the pre-operative mouth opening in all patients during a period of 01 month with active physiotherapy (Table 1).



**Fig. 4** Transient palsy of facial nerve branches



**Fig. 5** Haemorrhage from surgical site

## Discussion

Diagnostic arthroscopy of the TMJ, though considered to be minimally invasive and extremely safe, is not without complications. Complications range from 0 to 15%, and most of these are minor complications that resolve over a period of time without specific treatment or with conservative management. The complications of TMJ arthroscopy include otological complications such as injury to the external acoustic meatus, middle ear and tympanic membrane, hearing loss due to ear infection and sensorineural hearing loss [9]. Neurovascular complications may include facial nerve paresis/palsy, auriculotemporal nerve or mandibular nerve paresis, haemorrhage from superficial temporal vessels or transverse facial vessels. Other complications that have been reported include infection of the joint, damage to the base of the skull due to penetration of the middle cranial fossa, damage to joint structures such as the capsule, medial synovial drape, disc, synovium, cardiac arrhythmias, AV fistula, post-operative pain, restricted mandibular range of movements and involvement of the parapharyngeal space causing respiratory embarrassment.

Injury to the external acoustic meatus is usually caused due to the inadvertent malpositioning of the trocar within the joint space. Proper supine positioning of the patient with the head flat and the neck turned completely towards the opposite side and parallel to the floor minimises this problem [5]. However, the most important preventive manoeuvre involves directing the scope away from the walls of the external acoustic meatus. It is the authors'

**Table 1** List of immediate post-operative complications

Complication	No. of patients (%)
Lacerations of external acoustic meatus	03 (6)
Hearing loss	01 (2)
Transient facial nerve palsy	05 (10)
Sensory disturbances over the distribution of auriculotemporal nerve	01 (2)
Haemorrhage	05 (5)
Post-operative pain	05 (10)
Reduced mouth opening	15 (30)

observation that usage of a head ring during patient positioning during the procedure under GA makes the orientation difficult. Under local anaesthesia, prevention of inadvertent movement of the patient aided with appropriate anaesthesia and proper education of the patient prior to the procedure prevents this complication. Lacerations of the external acoustic meatus were seen in 6% of the cases with no cases of other serious otological complications. This is in accordance with the results of Tsuyama et al. [6] who found otological complications of blood clots and lacerations of the external acoustic meatus in 8% of his cases. However, no perforation of tympanic membrane due to the penetrating instrument was seen in our cases.

Hearing loss and vertigo have been reported by several authors [6, 10]. Abnormal tension between the two ligaments passing through the Hugier's canal located at the inner extremity of the petrotympanic fissure and the penetration of the foramen of Hueshke may be the causes of middle ear complications after arthroscopic surgery [10]. The one patient with reduced hearing was diagnosed of middle ear effusion which did not require any specific treatment but resolved spontaneously restoring pre-surgery hearing capabilities. None of our cases had severe hearing loss as described by several studies [9].

The otological injuries in our study are around 8% without breakup against an average of 0–1% in several studies [7]. It is noted that most of these complications were clustered during the initial cases of the cohort which commensurate with the initial steep learning curve attributed to arthroscopy. Higher rates of otological complications have also been reported by several authors to an extent of 8.6 [6], while some studies report no otological complications [11].

Facial nerve injuries were seen in 10% of our cases, while several studies report a maximum of 3.9% [7]. The most common reason the involvement of neurological structures is due to the extravasation of the irrigation fluid due to injudicious motorised pumping or negligent pumping by the assistant. The penetration point of the diagnostic arthroscopy is safely located at about 1 cm anterior to the tragus falling more or less within the safe zone of the facial nerve.

Sensory nerve injuries like the neuropraxia of the auriculotemporal nerve can also be caused due to the pressure effect from the extravasated fluid and less likely from the direct injury due to the penetration [5]. Rarely, pressure effect on the medial surface of the joint can cause neuropraxia of the branches of mandibular nerve such as the inferior alveolar nerve and the lingual nerve. Though not observed in any of our cases, several studies report an incidence of 0.6–0.8% [6, 11].

Bleeding was seen in 10% of our cases which closes by the complication reported by Gonzalez et al. [7] at 8.6%. However, it is much higher than that reported by other authors [6, 12]. The only clinical problem seen in those patients is the blurring of the superior joint space [7] which required more irrigation for clearance and visualisation. However, serious complications like slippage of instruments into areas like the sigmoid notch may cause haemorrhage from the maxillary artery. Such cases occur due to inadequate pre-operative diagnosis of especially fibrous ankylosis which leads to improper positioning of the arthroscope into the joint space [5]. Apart from bleeding, other vascular complications such as AV fistula [13–15], pseudoaneurysm and haematoma [11] have been described.

Infections of the joint have been reported in 0–1%, though no infections were reported in our cases. Infection of the joint seems to be quite rare. However, other infections such as otitis media, infections of the infratemporal fossa have also been reported [16].

Sporadic reports of other rare complications that have been reported include cardiac arrhythmias [17], reflex bradycardia [18], post-obstructive pulmonary oedema [19], parapharyngeal space swelling [8] and perforation of the middle cranial fossa [20]. The deepest point of the middle cranial fossa on an average was found to be 0.9 mm (0.5–1.5 mm), and injury to this site can occur due to misangulation of the instrument. The most dangerous angle for DP injury in the Frankfort horizontal plane (FH plane) was an inclination of the instrument base of  $-8^\circ$  dorsal and  $17^\circ$  and  $19^\circ$  caudal in the frontal plane [10].

Post-operative pain and reduction in mouth opening have not been dealt with in many studies assessing the complications of TMJ arthroscopy. No patient perceived

any pain due to procedure at the end of 01 week. Reduction in spontaneous mouth opening that was noted was restored to or more than the pre-operative mouth opening in all patients during the follow-up.

Instrument breakage within the joint space has been rarely reported [21]. It was of no consideration in our study since the arthroscopy was conducted for diagnosis, and no second portal was established for the introduction of other surgical instruments which have the ability to fracture and cause this complication.

The complications observed during the 08 month period in our institution were all short lived resolving spontaneously with no radical treatment. Though the rates of the complications appear to be greater than those reported in other studies, it is to note that they are mostly clustered around the initial stages confirming the steep learning curve of this minimal invasive procedure. Surgeon's experience and the level skill ensure seamless diagnostic arthroscopic procedure which according to many studies is superior to other imaging modalities. Though most of the complications are minor, care needs to be taken in the prompt diagnosis and intervention of the life-threatening complications that may occur.

#### Compliance with Ethical Standards

**Conflict of interest** All authors declare that there is no conflict of interest.

**Ethical Approval** This article does not contain any studies with animals performed by any of the authors.

**Human and Animal Rights** All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

**Informed Consent** Informed consent was obtained from all individual participants included in the study.

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