

## Deep Subfascial Approach to Prevent Facial Nerve Injury of TMJ Ankylosis

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### ABSTRACT

**Background:** The aim of the study was to improve safety and visibility in the surgical approach to the temporomandibular joint (TMJ). Conventional surgical approaches to the TMJ, the facial nerve remains at risk for transient or permanent facial nerve damage. The deep subfascial approach provides an additional layer of protection (the deep layer of the temporalis fascia and the superficial temporal fat pad) to the temporal and zygomatic branches of the facial nerve and thus, is the safest method to avoid facial nerve injury.

**Material and Methods:** To assess facial nerve injury (FN) following TMJ surgery using deep Subfascial approach and measuring it on House and Brackman facial nerve grading system (HBFNGS). A randomized study was conducted from JANU 2019 to DEC 2020 on 17 patients with unilateral and bilateral TMJ ankylosis at Department of Dentistry IGIMS, Patna. All patients were evaluated objectively for facial nerve injury using with House and Brackmann facial nerve injury grading system post-operatively and subjectively in the various time periods, i.e. 24 hours, 1month, and 6 months.

**Results:** Brackman facial nerve grading system at 24 hours post operatively- in the deep subfascial approach group, 94.7% of patients (16 cases) had Grade 1 injury and 5.8% (1case) had Grade 3 injury. The condition improved with time with full recovery of facial nerve injury (FN) at all surgical sites at 6 months.

**Conclusion:** The Deep Subfascial approach has a distinct advantage over the conventional approaches when dissecting the temporal region and is the safest method to avoid injury to facial nerve injury (FN).

**Keywords:** Temporomandibular Joint ankylosis; Deep subfascial; Nerve injury.

### INTRODUCTION

The temporomandibular joint (TMJ) ankylosis is fusion of head of condyle to Glenoid fossa. Joint space is a commonly affected due to various ailments like condylar fractures, internal derangements, TMJ pathologies, Middle ear infection, and forceps delivery. However, there is a major limitation in the access to the joint, i.e. the facial nerve and its branches. While performing the surgical procedures on the TMJ the temporal branch is among the most endangered of the facial nerve

branches to injury Contemporary literature reveals the incidence of facial nerve paresis which was found in 1.5% to 32% of patient.<sup>1,2</sup> Modern day publications describe the three approaches for TMJ exposure: Dissection that is superficial to the superficial temporal fascia,<sup>3</sup> exploitation of the surgical plane between the 2 layers of the temporalis fascia (subfascial)<sup>4</sup> and an approach deep to both layers of the temporalis fascia (Deep Subfascial).<sup>5,6,7</sup> This nerve lies in a condensation of

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the superficial fascia.<sup>11</sup> Moreover, depletion in the facial nerve function impedes psychic expression, functional deficiency, and can lead to an esthetic deformity which might lead to overwhelming loss of quality of life.<sup>8,9</sup> Recently, the deep subfascial approach has been advocated by many researchers stating that it is the safest approach in terms of preserving the integrity of the temporal branch of the facial nerve compared with the conventional approaches to the TMJ, because this nerve lies in a condensation of the superficial fascia.<sup>10-13</sup> The present study aimed to assess facial nerve (FN) injury following TMJ surgery using deep subfascial approach and measuring it on House and Brackman facial nerve grading system.<sup>14,15</sup>

**Aims and objectives:** To assess FN injury following TMJ surgery using deep subfascial approach and measuring it on House and Brackman facial nerve grading system (HBFNGS).

## MATERIALS AND METHODS

A randomized controlled study was carried out in the Department of Dentistry, IGIMS, Patna. All patients without any systemic complications, who strictly satisfied the incorporating guidelines, were included. The study population was composed of all patients presenting for evaluation and management of unilateral and bilateral TMJ ankylosis from JANU 2019 to DEC 2020. Inclusion criteria was: An established diagnosis of unilateral and bilateral TMJ ankylosis as proven by clinical and radiological diagnosis (Figure 1).

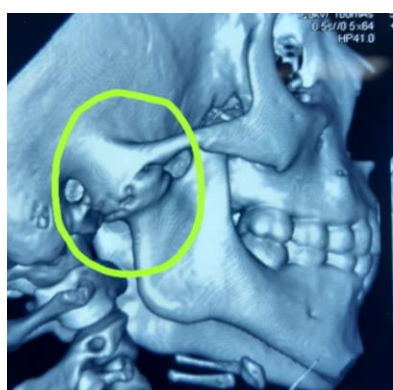


Fig 1: TMJ ankylosis.

Patients were excluded, had previous or current neurological disease that may adversely affect facial nerve function secondary to the previous or present neurological illness, patients who did not provide

written informed consent, and patients who were not willing to attend follow-up appointments. The diagnostic work-up was done for all patients; it included clinical examination and radiographic presentation. Standard lab investigations were done for all participants. Written informed consent was taken from all the subjects. In order to control the bias in the study, a single operator performed all the surgeries under general anaesthesia along with standard aseptic provisions and protocol.

## Technique

Fiberoptic bronchoscope intubation was done with the help of anesthesia team of IGIMS. A part preparation was done with butadiene and savlon. The inverted question mark skin incision was given at temporal region (Figs. 2) and begins about a pinna's length away from the ear, antero-superiorly just within the hair line and curves backwards and downwards well posterior of the main branches of the temporal vessels till it meets the upper attachment of the ear. The incision then follows the attachment of the ear and just preauricularly. The temporal incision must be carried through the skin and superficial fascia to the level of the temporal fascia (fig-3)



Fig 2: Inverted question marked incision.



Fig 3: Temporal incision upto the layer of superficial fascia of temporalis muscles (whit glistening in color).

The nerve filaments run in the superficial fascia and it is very important that the full depth of this fascia is reflected with the skin flap. Blunt dissection in this plane is carried downwards to a point about 2 cm above the malar arch where the temporal fascia splits. The pocket formed by the division contains fatty tissue which is easily visible through the thin lateral layer. Beyond this point there should be no attempt at further dissection of the superficial fascia from the temporal fascia. Starting at the root of the malar arch, an incision running at 45 ° upwards and forwards is made through the superficial layer of the temporal fascia. Once inside this pocket, the periosteum of the malar arch can be safely incised and turned forward as one flap with the outer layer of temporal fascia, superficial fascia containing the nerves and skin . The pocket can be developed anteriorly as far as the posterior border of the frontal process of the malar bone and posteriorly joined to the preauricular dissection which follows closely the cartilagenous external auditory canal beneath the glenoid lobe of the parotid gland and the superficial temporal vessels. A small tortuous branch, the auricular artery, runs backwards from the superficial temporal artery to the ear. The middle temporal artery which comes off the superficial temporal artery perforates the temporal fascia to supply temporalis muscle. These should be divided and ligated. Flap was raised and ankylotic mass was seen (Fig-4). Osteotomy was done and, Ankylotic mass was removed. Then gap of 2cm was created (fig-5). Temporalis fascia with some amount of temporalis muscles fibers taken and inserted into gap, which will prevent reankylosis. Interincisional mouth opening was achieved about 37mm. Closure was done in layer wise fig-6. Drain was placed. After 5 days when serosanguinous fluid was present in drain then it was removed.



Fig 4: Ankylotic mass present after removal of temporalis flap.



Fig 5: Osteotomy was done and gap was created.



Fig 6: Temporalis fascia inserted into gap.



Fig 7: Closure done in layer wise.

All twenty four patients were treated for unilateral and bilateral TMJ ankylosis. All patients were evaluated objectively for facial nerve function test before surgery (D0) and post-surgically after 24 hours , 30 days, 180days. Moreover, in order to determine the quality of life all the patients were followed post-surgically, at 1 month and 6 months.

However, in order to control the bias, the Nerve Function Test and quality of life questionnaire was evaluated by another surgeon. Patients were re-evaluated for any clinical recurrence on all visits. Computed Tomography (CT scan) was advised if clinical examinations revealed any doubt.

## RESULTS

The present study was conducted on 17 patients of unilateral TMJ ankylosis Assessment of facial nerve injury using deep subfascial approach to Temporomandibular joint Analysis of facial nerve injury was done using House Brackmann System .The House Brackmann system was used to analyze the grades of facial nerve injury at various time periods explained: Time periods, i.e. 24 hours, 1month, and 6 months, respectively.

The results are

House-Brackmann facial nerve grading system at 24 hours post operatively- in the deep subfascial approach group, 94.7 % of patients (16 cases) had Grade 1 injury and 5.8% (1 case) had Grade 3 injury (Table 1).

House-Brackmann facial nerve grading system at 1-month post operatively in the deep subfascial approach, 100% of patients continued to have grade 1 injury, i.e. the nerve function remained normal in all the patients (Table 2).

House-Brackmann facial nerve grading system at 6 month post operatively. In the deep subfascial approach, 100% of patients (17 cases) remained in grade 1 facial nerve injury

Table 1: Distribution of patients: HouseBrackmann facial nerve grading system at 24 hours post operatively.

| Grades  | Deep subfacial approach |      |
|---------|-------------------------|------|
|         | N                       | %    |
| Grade 1 | 16                      | 94.7 |
| Grade 2 | 0                       | 0    |
| Grade 3 | 1                       | 5.8  |
| Grade 4 | 0                       | 0    |
| Grade 5 | 0                       | 0    |
| Grade 6 | 0                       | 0    |

Table 2: Distribution of patients: House Brackmann facial nerve grading system at 1 month post operatively.

| Grades  | Deep subfacial approach |     |
|---------|-------------------------|-----|
|         | N                       | %   |
| Grade 1 | 17                      | 100 |
| Grade 2 | 0                       | 0   |
| Grade 3 | 0                       | 0   |
| Grade 4 | 0                       | 0   |
| Grade 5 | 0                       | 0   |
| Grade 6 | 0                       | 0   |
| Total   | 24                      | 100 |

Table 3: Grades and type of approach.

| Grades  | Deep subfacial approach |     |
|---------|-------------------------|-----|
|         | N                       | %   |
| Grade 1 | 24                      | 100 |
| Grade 2 | 0                       | 0   |
| Grade 3 | 0                       | 0   |
| Grade 4 | 0                       | 0   |
| Grade 5 | 0                       | 0   |
| Grade 6 | 0                       | 0   |
| Total   | 24                      | 100 |

Complete recovery at all surgical sites proves the point that the deep subfascial approach is the safest among the preauricular approaches as far as facial nerve injury (FN) is concerned. No sign of infection was observed in any patient in the follow-up appointments. Presence of Frey's syndrome defined as "perspiration of skin around the preauricular area while eating" was assessed on follow at 1 week, 1 month, 3 months, and 6 months postoperatively and was not evident in any of the patients. In all the surgical sites, at 6 months follow-up, scar was imperceptible and esthetically acceptable.

## DISCUSSION

The main purpose of this study was to evaluate the safety of a deep subfascial approach over on facial nerve injury following management of unilateral and bilateral TMJ ankylosis. Over the years, a number of surgical approaches to TMJ have been developed to attain the goal of successful removal of ankylotic mass, treating TMJ pathologies and condylar fracture. In a study conducted by do Egito Vasconcelos BC et al on facial nerve function after

surgical procedures for the treatment of temporomandibular pathology using House-Brackmann facial nerve grading system (HBFNGS) on 32 patients with 50 joints pathology using subfascial approach, they found that of 32 patients, 12.5% (8% of the 50 approaches) revealed signs of facial nerve injury. There was a significant amount of post operative facial nerve injury in the patients who underwent surgery for TMJ ankylosis ( $p=0.014$ ) and for gap arthroplasty patients ( $p=0.014$ ). The study reveals that at 24 hours, none of the patients showed total nerve paralysis or severe dysfunction, only a moderately severe dysfunction (50%), or moderate dysfunction (50%). The forehead area was the most commonly affected. However, at 3 months follow-up, all patients acquired normal facial nerve function.<sup>16</sup> Our study showed similar results, however, there was no significant injury present at the six months time interval. This high frequency of nerve injury in our study during a subfascial approach, up to a period of 1 month, could have been either due to heavy retraction causing compression and/ or stretching of nerve fibre resulting in neuropraxia, or in a few cases it could have been due to inadvertent suture ligation of facial nerve fibers. Politi et al applied the deep subfascial approach to 21 patients and did not observe any temporary or permanent facial nerve function loss. They reported that the facial nerve had been safely avoided, and the function of the auricular temporal nerve was also preserved.<sup>10</sup> Similarly, Kenkere et al carried out a detailed study on 12 patients and made 15 surgical exposures to access the TMJ and zygomatic arch. They used a deep subfascial approach and found that no functional deficit was observed in either the temporal or zygomatic branches of the facial nerve as ascertained by clinical examination.<sup>12</sup> Likewise, in our study, of 12 patients in whom a deep subfascial approach used, only one patient had grade 3 nerve injury; the remaining 11 showed grade 1 nerve injury at 24 hour post operatively. The low frequency of nerve injury in our study during deep subfascial approach. The evaluation was done in terms of facial nerve injury using House-Brackmann grading. The present study used the Face instrument to analyse patient perception regarding the approaches. The results of the study clearly indicate that no significant difference exists between the two approaches, in consideration of facial nerve injury during long term follow-up.<sup>9</sup>

Further studies with a larger number of cases and multicenter involvement can be done for a more definitive conclusion. Although during 6-month follow up both the approaches show 100% recovery, still we found that a deep subfascial approach is a better approach during the initial follow-up of the patient in terms of facial nerve injury, since this technique provides an additional layer of protection (the deep layer of the temporalis fascia and the superficial temporal fat pad) to the temporal and zygomatic branches of the facial nerve. The plane of dissection is distinctly identifiable and reliable, and the technique is simple to use with basic knowledge of the anatomy of the region. This technique is indicated for any surgery of the TMJ, including ankylosis and zygomatic arch and especially for secondary surgeries in the temporal region and TMJ, as well as correction of post-traumatic deformity of the zygomatic arch and complex.

## CONCLUSION

A deep subfascial approach has proven to be a safer surgical procedure with respect to facial nerve injury as compared to a routine subfascial approach, although long term follow-ups render the differences between the approaches insignificant. Nonetheless, a deep subfascial approach can be considered for both routine and complex TMJ ankylosis cases.

## CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

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