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Post-Traumatic Temporomandibular Joint Ankylosis Managed by Interposition Gap Arthroplasty Using Temporalis Muscle Flap: A Case Report

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Abstract: ***Temporomandibular joint (TMJ) ankylosis is a debilitating condition characterised by restricted or absent mandibular movement, most commonly arising from trauma, infection, or prior surgical intervention. We report a case of a 30-year-old male who presented with severe trismus (maximum inter-incisal opening of 4 mm) following a road traffic accident (RTA) approximately two years prior, during which he had sustained a mandibular symphysis fracture managed surgically with open reduction and internal fixation (ORIF). The restricted mouth opening was attributable to post-traumatic fibro-osseous ankylosis of the left temporomandibular joint, confirmed on pre-operative computed tomography (CT) demonstrating joint-space reduction, condylar head flattening, articular surface irregularity, and probable intra-articular loose bodies consistent with secondary osteoarthritis. The patient was managed by interpositional gap arthroplasty using an ipsilateral temporalis muscle flap. Intra-operatively, a maximum inter-incisal opening of 41 mm was achieved following condylectomy and gap creation. Post-operative inter-incisal opening was 29 mm at first review, 31 mm at three months, and 41 mm at one year—demonstrating a satisfactory functional trajectory. Post-operative imaging including orthopantomogram (OPG) and cone-beam CT (CBCT) confirmed the absence of re-ankylosis with maintenance of the arthroplasty gap. A new post-operative CT analysis of axial and sagittal sections is presented, delineating the condylectomy defect, absence of bony bridging, and the position of the temporalis interposition. This case underscores the importance of timely intervention, meticulous surgical technique, and rigorous post-operative physiotherapy in the management of post-traumatic TMJ ankylosis.***

Clinical trial number: Not applicable

Keywords: Temporomandibular joint ankylosis; interpositional arthroplasty; temporalis muscle flap; post-traumatic ankylosis; trismus; gap arthroplasty; condylectomy; computed tomography

1. Introduction

Temporomandibular joint (TMJ) ankylosis, defined as the pathological fusion of the mandibular condyle to the glenoid fossa of the temporal bone, represents one of the most functionally compromising conditions encountered in oral and maxillofacial surgery. The condition leads to severe restriction of mouth opening, facial disfigurement, difficulty with mastication, impaired speech, and a significant psychosocial burden on affected individuals [1]. Etiologically, TMJ ankylosis may be classified as true (intra-articular; bony or fibrous) or false (extra-articular), with trauma and infection being the predominant causative factors in developing nations [2].

Post-traumatic ankylosis is particularly insidious; it most commonly follows condylar fractures in children, but may also arise secondary to injuries to the symphysis, parasymphysis, or body of the mandible that produce haemarthrosis with subsequent fibro-osseous proliferation within the joint. When recognised late, the resulting joint pathology- characterised by condylar resorption, articular surface irregularity, and osteophyte formation- is frequently accompanied by secondary osteoarthritic changes that further complicate surgical management [3].

The surgical management of TMJ ankylosis has evolved considerably, encompassing simple condylectomy, gap arthroplasty, interpositional arthroplasty, and total alloplastic joint replacement. Interpositional arthroplasty- in which a biologic or alloplastic material is interposed between the osteotomised surfaces- is widely regarded as the gold standard for preventing re-ankylosis [4]. Autogenous interpositional materials including temporalis muscle and fascia, dermis, auricular cartilage, and fat are preferred in resource-limited settings for their biocompatibility, local availability, and low cost. The temporalis muscle flap, in particular, offers proximity, robust vascularity from the deep temporal vessels, and a surface area sufficient to line the osteotomy gap reliably [5,6].

We present a case of post-traumatic TMJ ankylosis in a 30-year-old male, managed successfully by interpositional gap arthroplasty using a temporalis muscle flap. We also present a focused analysis of the post-operative CT findings- an aspect infrequently reported in the existing literature—which provides radiological confirmation of the surgical outcome and the integrity of the arthroplasty gap.

2. Case Report

2.1 Patient Presentation

A 30-year-old male patient presented to the Department of Oral and Maxillofacial Surgery with a chief complaint of markedly restricted mouth opening of approximately two years' duration. The patient's history was significant for a road traffic accident occurring approximately two years prior, following which he was diagnosed with a mandibular symphysis fracture and underwent open reduction and internal fixation (ORIF) at an outside institution. Post-operatively, the patient noticed a progressively worsening limitation in mouth opening that had plateaued at approximately 3–4 mm (***Figure 1)*** over the preceding several months. He reported difficulty in mastication, impaired oral hygiene, muffled speech, and a significant reduction in quality of life.

On clinical examination, the patient was a well-built adult male with a mildly asymmetric face and apparent fullness over the left preauricular region. Maximum inter-incisal opening (MIO) was recorded at 4 mm. Lateral and protrusive mandibular excursions were grossly restricted. The TMJs were non-tender on palpation, with no appreciable condylar movement detectable bilaterally on digital palpation or auscultation. Intraoral examination revealed a maintained, functional dentition without significant periodontal pathology.

Figure 1: Pre-operative inter-incisal opening (IIO) = 4 mm

2.2 Radiological Investigations

2.2.1 Pre-operative CT Findings

Pre-operative computed tomography of the face constituted the primary imaging modality for surgical planning. The CT demonstrated the following key findings on the left side:

1) Reduction in the left TMJ space with irregularity of the articular surfaces of both the mandibular condyle and the temporal articular surface.
2) Flattening of the condylar head, indicating long-standing mechanical stress and articular remodelling.
3) Small calcified intra-articular fragments antero-inferior to the articular eminence and posterior to the mandibular condyle, consistent with probable loose bodies.
4) The right TMJ was radiologically normal.
5) A metallic implant was noted in the body of the mandible, consistent with prior ORIF of the symphysis fracture. Both orbits, the paranasal sinuses, pterygoid plates, maxilla, hard palate, and visualised cranial structures were unremarkable.

The radiological impression was: reduction in left TMJ space with articular surface irregularity, probable loose bodies, and condylar head flattening—features consistent with secondary osteoarthritis of the left TMJ superimposed on post-traumatic fibro-osseous ankylosis. These findings provided the radiological basis for surgical intervention.

Figure 2A: Pre-operative CT – axial section, **Figure 2B:** Pre-operative CT – coronal section, **Figure 2C:** Pre-operative CT – sagittal section

2.2.2 Pre-operative Orthopantomogram

The pre-operative OPG corroborated the CT findings, revealing a significantly reduced and ill-defined left TMJ space with apparent loss of normal condylar head morphology on the left side. The right condylar head appeared of normal morphology and configuration. A well-defined metallic implant (miniplates and screws) was visible at the symphyseal region. No additional dentoalveolar pathology was identified.

Figure 2D: Pre-operative orthopantomogram (OPG)

2.3 Diagnosis

Based on the clinical history, presentation, and radiological findings, a diagnosis of post-traumatic fibrous ankylosis with secondary osteoarthritis of the left TMJ was established, classified as Sawhney Type I/II fibrous ankylosis with superimposed degenerative changes [1].

2.4 Surgical Management

Following thorough pre-anaesthetic evaluation and informed consent, the patient was scheduled for interpositional gap arthroplasty of the left TMJ under general anaesthesia administered via nasal fibre-optic intubation, necessitated by the severely restricted mouth opening.

A standard pre-auricular (Al-Kayat and Bramley) approach was employed to access the left TMJ [7]. Careful dissection through the subcutaneous tissue, SMAS layer, and temporoparietal fascia was performed, with deliberate identification and preservation of the frontal branch of the facial nerve. The TMJ capsule was identified and incised. Intra-articular fibro-adhesions were excised. A condylectomy was performed at the level of the condylar neck, and the excised condylar head along with all identifiable intra-articular loose bodies was retrieved. The osteotomised surfaces were contoured with a rotary bone file to create a gap of approximately 10–15 mm between the condylar stump and the glenoid fossa.

An ipsilateral temporalis muscle flap was harvested via the same pre-auricular incision, taking care to preserve its pedicle and deep temporal blood supply. The flap was transposed inferiorly and sutured over the osteotomised glenoid fossa surface, effectively lining the arthroplasty gap and creating an interpositional barrier against re-ankylosis. The wound was irrigated and closed in anatomical layers.

Intra-operatively, with mouth props in situ following gap arthroplasty, a maximum inter-incisal opening of 41 mm was achieved, confirming adequate gap creation and satisfactory joint release.

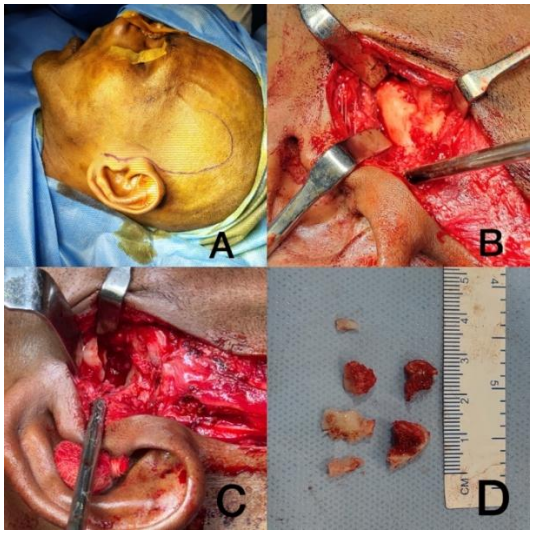

Figure 3A: Al-Kayat and Bramley's incision marking, **Figure 3B:** Ankylotic mass, **Figure 3C:** Removal of ankylotic mass, **Figure 3D:** Excised ankylotic mass

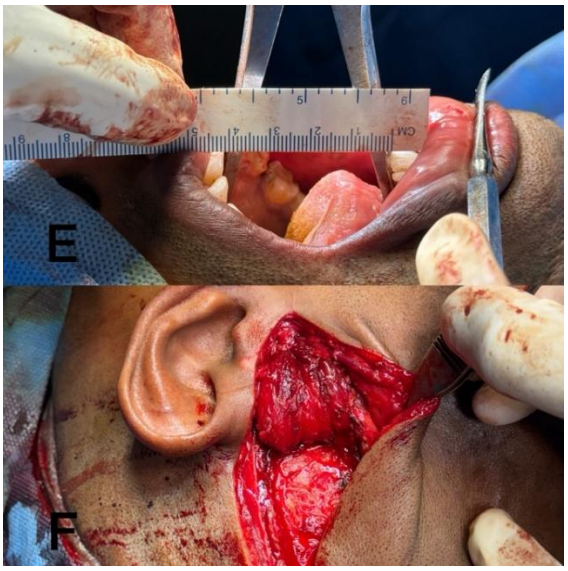

Figure 3E: Intra-operative IIO = 41 mm post-arthroplasty, **Figure 3F:** Temporalis muscle flap transposed

2.5 Post-operative Outcomes and Follow-up

Post-operative physiotherapy was commenced from the third post-operative day utilizing Hister's exercises and custom wooden spatulas, subsequently progressing to a Thera bite jaw exerciser. The patient was counselled regarding the critical importance of regular, consistent physiotherapy in preventing re-ankylosis. (Table 1)

Table 1: Maximum Inter-incisal Opening (MIO) at Sequential Time Points

Time Point	MIO (mm)	Remarks
Pre-operative	4	Severely restricted; RTA sequela
Intra-operative (post-arthroplasty)	41	Measured after gap arthroplasty
1st Post-operative Review	29	Active physiotherapy ongoing
3-Month Follow-up	34	Stable; continued improvement
1-Year Follow-up	41	Stable; satisfactory functional outcome

At the first post-operative follow-up, (***Figure 4A***) MIO was 29 mm. By the three-month review, MIO had improved to 31 mm (***Figure 4B***)- representing a net functional gain of 27 mm over the pre-operative baseline. At one-year review, MIO was 41 mm (***Figure 4C***), equaling the intra-operative measurement and confirming an excellent long-term functional result. The patient reported substantial improvements in mastication, speech, and quality of life.

Figure 4A: Post-operative MIO at first follow-up

Figure 4B: Post-operative MIO at third follow-up

Figure 4C: Post-operative MIO at 1 year follow-up

2.6 Post-operative Orthopantomogram (OPG) Findings

Post-operative OPG was obtained to assess the surgical outcome. The OPG demonstrated a well-defined radiolucent gap at the left ramus-condyle unit, consistent with the condylectomy and the successfully created arthroplasty gap. No evidence of bony bridging or re-ankylosis was identified on the operated left side. The right condyle and right TMJ space appeared normal. The symphyseal implant remained in situ without radiological evidence of hardware failure or loosening. The overall appearance was consistent with a satisfactory post-arthroplasty state. (fig 4D)

Figure 4D: Post-operative orthopantomogram (OPG)

2.7 Post-operative CBCT Findings

Post-operative CBCT was performed and is presented here to provide detailed radiological documentation of the surgical outcome. The images below represent the axial (Figure 5) and sagittal (Figure 6) CT sections obtained following interpositional gap arthroplasty, demonstrating the following findings:

Axial Section (Figure 5): The axial section at the level of the mandibular condyle demonstrates an absence of the left condylar head, confirming successful condylectomy. The arthroplasty gap is clearly delineated, with no radiological

evidence of bony bridging, calcification, or heterotopic ossification within the gap. The temporalis muscle interposition occupies the former joint space as a soft-tissue density. The right TMJ demonstrates a preserved articular space with a morphologically intact condylar head, serving as a normal internal reference. The surrounding osseous anatomy of the zygomatic arch, temporal bone, and mandibular ramus is intact. No post-operative complications such as infective collections or foreign body reaction are identified.

Sagittal Section (Figure 6): The sagittal section through the left TMJ region confirms complete absence of the condylar head with a well-maintained arthroplasty gap between the condylar stump and the temporal articular surface. The previously identified articular irregularity, condylar flattening, and intra-articular calcifications are no longer present, confirming their removal at surgery. The interposed soft-tissue mass (temporalis flap) is identifiable within the gap as a non-mineralised tissue density. The glenoid fossa contour is preserved. No recurrent bony fusion across the gap is visualised. The mandibular ramus below the condylectomy level demonstrates intact cortical and trabecular architecture.

In summary, the post-operative CT findings corroborate the satisfactory surgical outcome evidenced clinically and on OPG, providing three-dimensional confirmation of: (i) complete condylectomy; (ii) an unobstructed arthroplasty gap; (iii) absence of re-ankylosis or heterotopic ossification; and (iv) preservation of adjacent osseous and soft-tissue structures.

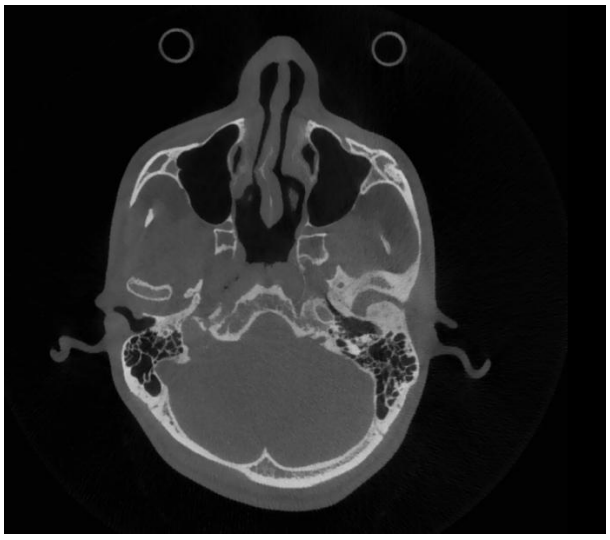

Figure 5: Post-operative axial CT section (bone window) demonstrating absence of the left condylar head following condylectomy, with a clearly defined arthroplasty gap and no evidence of bony bridging or re-ankylosis. Right TMJ is preserved (normal internal reference).

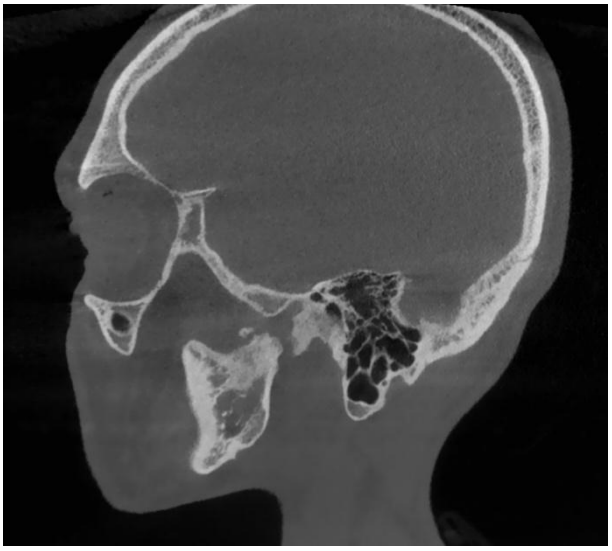

Figure 6: Post-operative sagittal CT section through the left TMJ demonstrating the condylectomy defect, well-maintained arthroplasty gap, soft-tissue density of the interposed temporalis flap, and absence of recurrent fusion or heterotopic ossification

3. Discussion

TMJ ankylosis following trauma is a well-recognised, albeit preventable, complication of mandibular injuries. In the present case, the initial insult- a mandibular symphysis fracture sustained in a road traffic accident- likely precipitated haemarthrosis in the ipsilateral TMJ via indirect transmission of impact forces along the mandibular arch. The subsequent intracapsular haemorrhage initiated an inflammatory cascade that culminated in fibroblastic proliferation, fibrous adhesion formation, and ultimately fibro-osseous ankylosis of the left TMJ. The two-year delay before presentation permitted progressive degenerative changes, as evidenced radiologically by condylar head flattening, articular surface irregularity, and intra-articular calcific loose bodies- all features consistent with secondary osteoarthritis superimposed on post-traumatic ankylosis [3,4].

The pre-operative CT findings in this case merit focused discussion. Reduction in TMJ joint space is pathognomonic of ankylosis, reflecting loss of the normal articular disc architecture and its replacement by fibrous or fibro-osseous tissue. Condylar head flattening is a classical radiological sequela of long-standing articular stress and abnormal load distribution, analogous to degenerative joint changes observed in weight-bearing joints elsewhere in the body. The calcified intra-articular fragments- described as 'probable loose bodies'- antero-inferior to the articular eminence likely represent detached osteocartilaginous fragments, a recognised complication of TMJ osteoarthritis. Their surgical removal is of importance, as retained loose bodies may serve as a nidus for post-operative joint irritation, heterotopic ossification, or early re-ankylosis [5].

The pre-operative OPG, whilst limited in three-dimensional resolution, provided clinically relevant information regarding overall joint morphology, contralateral TMJ status, and the position of the symphyseal implant. It confirmed the normal

architecture of the right condylar joint, thereby directing the surgical approach to the affected left side.

The post-operative CT imaging presented in this report constitutes an important addition to the case documentation. CT-based assessment of post-arthroplasty outcomes is underutilised in the published literature, with the majority of reports relying on OPG or CBCT alone. Three-dimensional sectional imaging, however, provides unique information regarding the integrity of the arthroplasty gap, the volumetric extent of condylar removal, and early identification of heterotopic ossification or bony bridging that may not be appreciable on two-dimensional radiographs. In this case, the post-operative CT unambiguously confirmed complete condylectomy, a patent arthroplasty gap, and the soft-tissue interposition- findings that collectively validate the adequacy of surgical technique and predict a low risk of re-ankylosis.

The choice of interpositional gap arthroplasty using a temporalis muscle flap is well-supported in the literature. Gap arthroplasty without interpositional material carries a reported re-ankylosis rate of up to 30%, attributed to the osteogenic potential of the periosteum at osteotomy edges and to haemarthrosis within the newly created gap [4,6]. The interposition of a vascularised tissue flap between the cut surfaces mitigates this risk by providing a physical barrier to bone-to-bone contact and introducing a well-vascularised bed that promotes soft-tissue healing without fibro-ossification. The temporalis muscle flap is ideally suited for this purpose: its proximity to the TMJ permits transposition without tension; its robust blood supply from the deep temporal vessels ensures viability; and its fibrous composition provides durable barrier function [6].

The intra-operative MIO of 41 mm confirms adequate gap creation, and the subsequent reduction to 29 mm at first follow-up represents the expected physiological response- attributable to post-operative oedema, soft-tissue splinting, and protective muscle guarding. The progressive recovery to 31 mm at three months and 41 mm at one year is consistent with published outcomes for interpositional arthroplasty using temporalis flaps, where post-operative MIOs of 28–35 mm at three to six months are reported [6,8].

Post-operative physiotherapy deserves emphasis as an independent determinant of functional outcome. Even a technically sound arthroplasty may yield suboptimal results in the absence of consistent, supervised jaw exercises. Early institution of active physiotherapy- commencing within three to five days of surgery—and the use of objective mouth-opening aids are essential components of the post-operative protocol. Patient education and compliance monitoring at each follow-up are equally important.

4. Conclusion

This case illustrates the successful management of post-traumatic fibrous ankylosis of the left TMJ, complicated by secondary osteoarthritic changes, using interpositional gap arthroplasty with a temporalis muscle flap. A pre-operative MIO of 4 mm improved progressively to 41 mm at one-year follow-up, representing a clinically and functionally meaningful outcome. The pre-operative CT was invaluable in delineating the extent of joint pathology and guiding the surgical plan. Post-operative CT imaging- presented here with axial and sagittal sections- provided unambiguous three-dimensional confirmation of complete condylectomy, a patent arthroplasty gap, soft-tissue interposition, and absence of re-ankylosis; findings that complement and extend the information available from conventional OPG and CBCT.

Post-traumatic TMJ ankylosis, though preventable through early condylar fracture management and physiotherapy, remains a challenging reconstructive problem when encountered late. Interpositional arthroplasty with autogenous tissue is a reliable, cost-effective, and reproducible technique in appropriately selected patients. Routine incorporation of post-operative CT assessment into the follow-up protocol is advocated to provide objective radiological confirmation of outcome and early detection of complications. Early referral to specialised maxillofacial units, meticulous surgical technique, and unwavering commitment to post-operative rehabilitation are the cornerstones of a successful outcome.

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Conflict of Interest
The authors declare no conflicts of interest.

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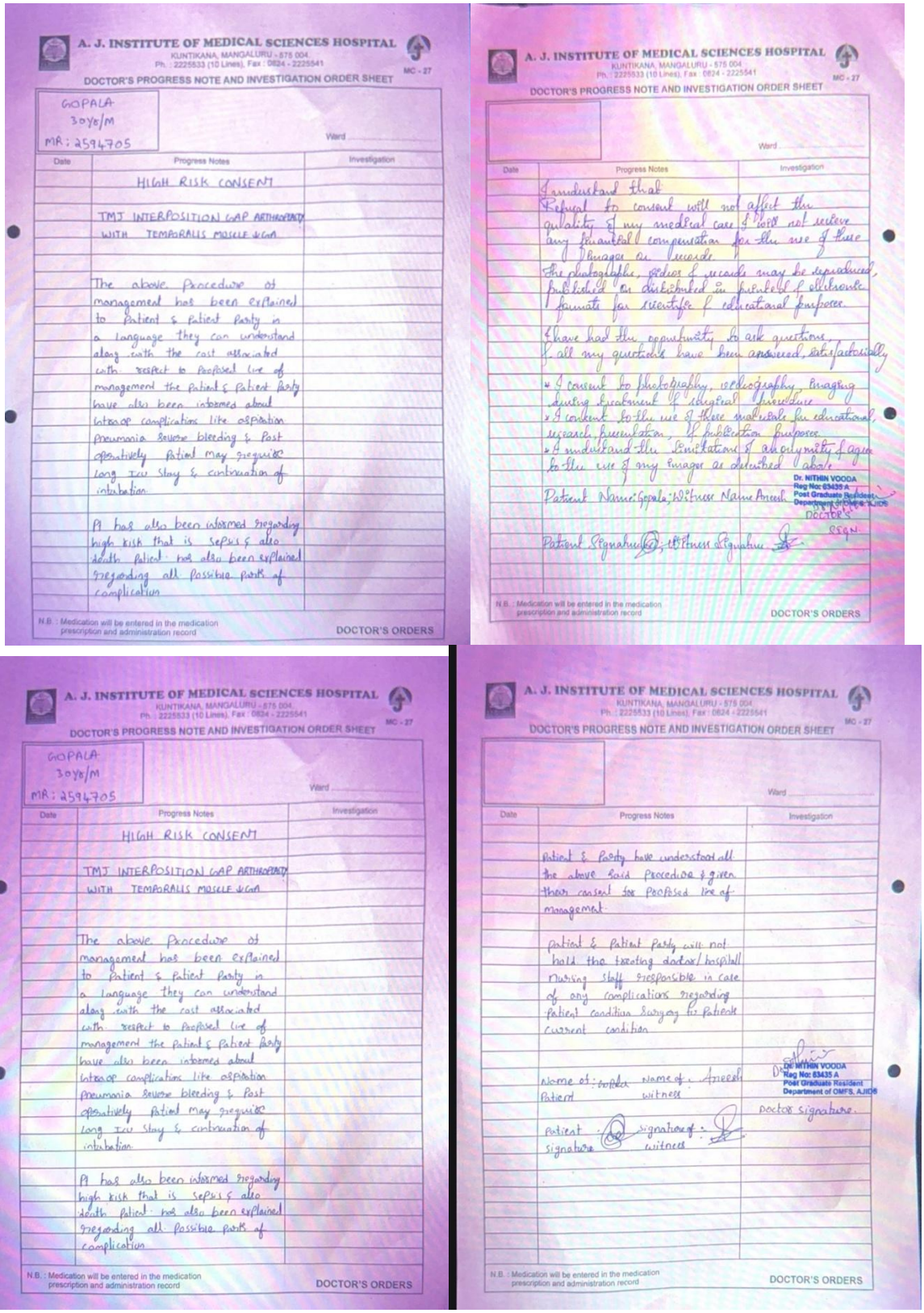
Consent Forms



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GOPALA
30Y/M
MR: 2594705

Ward

Date	Progress Notes	Investigation
	HIGH RISK CONSENT	
	TMJ INTERPOSITION GAP ARTHROPLASTY WITH TEMPORALIS MUSCLE FLAP	
	The above procedure of management has been explained to patient & patient party in a language they can understand along with the cost associated with respect to proposed line of management the patient & patient party have also been informed about intra op complications like aspiration pneumonia severe bleeding & post operatively patient may require long ICU stay & continuation of intubation	
	Pt has also been informed regarding high risk that is sepsis & also death patient has also been explained regarding all possible perils of complication	

N.B. : Medication will be entered in the medication prescription and administration record
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Date	Progress Notes	Investigation
	Patient & Party have understood all the above said procedure & given their consent for proposed line of management Patient & Patient Party will not hold the treating doctor/ hospital/ Nursing staff responsible in case of any complications regarding patient condition surgery or patients current condition Name of: Gopala Patient Name of: Ameen witness Patient Signature Signature of witness Dr. NITHIN VOODA Reg No: 83435 A Post Graduate Resident Department of OMFS, AJIDS Doctor signature	

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