

# Mandibular Osteosarcoma: A Case Report on Physiotherapeutic Rehabilitation

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## ABSTRACT

Osteosarcomas are aggressive malignant bone tumours that rarely affect the jaw in comparison to long bones. When these tumours impact the mandible, they present distinct challenges, necessitating not only complex surgical procedures but also causing significant functional and psychological impairment. Surgical management, such as mandibular reconstruction, frequently results in reduced jaw mobility, decreased mastication, changed speech, persistent discomfort, and mental anguish, all of which have a substantial influence on daily life and social interaction. Physiotherapeutic rehabilitation is essential for regaining function, avoiding subsequent problems, and fostering psychological adaptation. This case report describes a systematic physical therapy regimen designed specifically for a patient who had mandibular reconstruction after osteosarcoma resection. The rehabilitation strategy included targeted jaw mobility exercises, muscle strengthening, soft-tissue treatments, and speech-focused therapy, as well as counselling to address psychosocial issues. Improved mandibular function, less discomfort, improved masticatory efficiency, better speech articulation, and increased psychological resilience were noted. The findings emphasise the need for an integrated physiotherapy strategy in maximising recovery and guaranteeing long-term functional and emotional well-being in patients with jaw osteosarcoma.

**Keywords:** Bone neoplasms rehabilitation, Physical therapy modalities, Postoperative care, Quality of life, Speech disorders rehabilitation

## CASE REPORT

A 28-year-old male from east-central India was referred to the physiotherapy department after two weeks following surgical resection and reconstruction of the mandible due to histologically confirmed osteosarcoma. The patient initially presented with a six-month history of dull, aching pain in the left mandibular and Temporomandibular Joint (TMJ) region, exacerbated by chewing, speaking, and wide mouth opening. His symptoms progressed to include jaw stiffness, difficulty with mastication, mild sleep disturbance, and psychosocial distress related to facial asymmetry and strained family relationships. After multiple consultations and diagnostic procedures, including an initial misdiagnosis as fibroma and odontogenic infection, he underwent two major surgeries: the first involving lesion excision and tooth removal, and the second comprising wide local excision, mandibular resection, and reconstruction using a skull bone graft. Postoperatively, he exhibited facial oedema, restricted mandibular movement, and mild distress due to pain, although he remained haemodynamically stable. At the time of physiotherapy initiation, the patient was undergoing adjuvant chemotherapy and psychological counselling.

Baseline physiotherapeutic assessment was conducted to evaluate the patient's functional deficits following mandibular reconstruction. Pain profiling was performed using the Numeric Pain Rating Scale (NPRS), which revealed moderate to severe discomfort during activities such as chewing, speaking, and oral hygiene [Table/Fig-1].

Mandibular range of motion was measured, including inter-incisal opening, lateral excursion, and protrusion, all of which were below normal limits [Table/Fig-2].

Functional oral capabilities were assessed using the Functional Intraoral Glasgow Scale (FIGS), indicating a moderate functional deficit with limitations in mouth opening, chewing, and speech clarity [Table/Fig-3]. Additional clinical observations noted left-sided facial asymmetry, reduced muscle tone, and coordination deficits.

Psychosocial screening revealed elevated anxiety levels and concerns related to facial appearance and social reintegration.

Activity	Pain (0-10)	Pain level description
Rest (lying down, relaxed)	2	Mild pain
Speaking	4	Moderate pain
Chewing soft food	6	Moderate to severe pain
Chewing hard food	8	Severe pain
Opening mouth wide (e.g., yawning)	7	Severe pain
Oral hygiene (brushing, rinsing)	5	Moderate pain
Swallowing	3	Mild to moderate pain
Facial touch or pressure on the mandible	6	Moderate to severe pain

**[Table/Fig-1]:** Illustrates the baseline physiotherapeutic pain assessment of a patient following mandibular reconstruction for osteosarcoma.

Parameter	Before physiotherapy	After physiotherapy (4 weeks)	Normal range
Inter-incisal distance (mouth opening)	18 mm	42 mm	35-45 mm
Lateral jaw movement (left to right)	5 mm	10 mm	8-12 mm
Protrusion (forward jaw movement)	4 mm	8 mm	6-10 mm
Pain on movement (NPRS Scale)	6/10	2/10	0 (No pain)

**[Table/Fig-2]:** Range of motion of the TMJ pre and post physiotherapeutic intervention using a vernier calliper.

Domain	Before treatment	After 4 weeks	Notes
Mouth opening	3 (18 mm opening)	1 (42 mm opening)	Significant improvement in ROM
Chewing function	2 (tolerates liquids only)	1 (chewing soft solids)	Improved functional ability
Speech ability	4 (mild slurring due to swelling)	2 (clearer speech)	Swelling reduced, better articulation

Total FIGS Score	9/15 → Moderate Functional Deficit	4/15 → Mild Functional Deficit	Marked functional recovery
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**[Table/Fig-3]:** Functional Intraoral Glasgow Scale (FIGS) scoring pre- and post-physiotherapeutic intervention. Based on these findings, a two-phase rehabilitation protocol was initiated.

From 0-2 weeks, the focus was on reducing TMJ pain, managing facial oedema, improving limited mouth opening, and initiating gentle mobility, facial muscle reactivation, and relaxation techniques. Interventions include local massage, TMJ mobilisation (Grade I-II), Proprioceptive Neuromuscular Facilitation (PNF) facial exercises, passive-assisted opening, and task-based training for basic functions like chewing and hygiene [Table/Fig-4].

S. No.	Problem	Goal	Intervention	Dosage/Frequency
1	Pain in the TMJ region (NPRS 7/10)	To reduce pain	Local massage over masseter, temporalis, and pterygoid (circular friction & kneading)	10 min/day
2	Restricted mouth opening	To improve mouth opening.	Post-isometric relaxation (masseter): 5-7 sec contraction → relax → gentle stretch	3-5 reps × 1 session × daily
			Passive assisted mouth-opening (with some assistive device/fingers)	1-2 sets × 1 session
			TMJ mobilisation (Grade I-II distraction, gliding)	3-5 times × 1 session × 5 days/week (by a mobilisation-certified physiotherapist)
3	Impaired TMJ mobility	TMJ mobility and function	Active Opening and closing, lateral deviation, and tongue movement inside the mouth	10 reps × 2 sets × 1 sessions
4	Facial muscle asymmetry and weakness (left)	Facial muscle tone and symmetry	PNF facial exercises: Smiling, puffing cheeks, eyebrow lifts	Daily (morning/evening)
			Mirror biofeedback	Daily (morning/evening)
5	Mild postoperative facial oedema	Oedema Reduction	Manual lymphatic drainage	2 times/day
			Positioning with elevation	2 times/day
6	Increased anxiety/tension	Relaxation and anxiety relief	Deep breathing exercises	5 min/session
			Guided relaxation (post-exercise) meditation	5 min/session 15 min/2 times/day.
7	Difficulty with chewing, speaking, and oral hygiene	Functional reintegration	Task-based training with soft foods, gentle speech drills, oral hygiene	Modified, daily

**[Table/Fig-4]:** Physiotherapeutic management from 0-2 weeks.

From 2-4 weeks, the goal shifts to restoring full function with progressed TMJ mobilisation (Grade II-III), increased repetitions of stretching and ROM exercises, and more advanced facial coordination drills. Functional activities are intensified to include firmer foods and improved speech, along with continued relaxation strategies to support overall recovery [Table/Fig-5]. At the end of four weeks, significant improvements were documented across all outcome measures. NPRS scores decreased from 6/10 to 2/10 during functional activities [Table/Fig-1], indicating effective pain management. Inter-incisal distance improved from 18 mm to 42 mm, reflecting restored jaw mobility [Table/Fig-2]. FIGS scores improved from 9/15 to 4/15, denoting a shift from moderate to mild functional deficit [Table/Fig-3]. Subjectively, facial symmetry and coordination showed marked enhancement, and the patient reported increased confidence in social interaction and communication. There was a

marked progression in jaw opening from baseline to the fourth week of rehabilitation from 18 mm to 42 mm [Table/Fig-6a,b].

S. No.	Problem	Goal	Intervention	Dosage/Frequency
1	Pain in TMJ (improved NPRS)	Maintain comfort	Local massage over muscles	10 min/day or as needed
2	Restricted mouth opening	Further improve range	Post-Isometric Relaxation with increased stretch	10 reps/session × daily
			Passive assisted opening	5 sets/day
			TMJ mobilisation (Grade II-III distraction, anterior glide)	10 times /1 session × 5 days/week
3	Impaired TMJ mobility	Improve function	Controlled ROM: More active jaw movements, resistive tongue mobility	2 sets × 15 reps/day
4	Facial weakness	Restore symmetry	PNF facial exercises (more complex patterns)	Twice daily
			Mirror biofeedback with coordination tasks	Twice daily
5	Anxiety/tension	Continued relaxation	Deep breathing exercises	5-10 min/session
			Guided relaxation, possibly with music	10 min/session
6	Functional difficulty	Restore function	Task-based training: Gradually introduce firmer foods, clear speech drills	Progressively increase daily tasks

**[Table/Fig-5]:** Physiotherapeutic management from 2-4 weeks.



**[Table/Fig-6]:** a) Describe the measurement of jaw opening on day 1 of physiotherapeutic intervention; b) Maximum complete opening of the mouth on the 5<sup>th</sup> day of the 4<sup>th</sup> week of physiotherapeutic intervention.

## DISCUSSION

The current case highlights the dual difficulty of managing mandibular osteosarcoma: obtaining effective oncologic control while restoring functional and psychosocial integrity.

Mandibular osteosarcoma is rare and needs an integrated and tailored care strategy because of its aggressive nature and functional effects. Surgical excision and prompt reconstruction are crucial parts of the therapy, but complete recovery requires a multidisciplinary approach, not just surgery [1]. Physiotherapeutic intervention is crucial in restoring important oral functions such as mastication, speaking and jaw mobility. Managing psychological well-being simultaneously is also crucial because it reduces emotional suffering and enhances overall quality of life [2].

Mandibular defect reconstruction using vascularised flaps remains the gold standard for restoring bone continuity, facial symmetry,

and providing a foundation for future dental rehabilitation. Our patient underwent microvascular repair (most likely with a free fibula flap), which is consistent with standard techniques for oncologic mandibular abnormalities [3]. Long-term results corroborate this approach's durability: one of the first documented cases of mandibular repair using a free fibula flap demonstrated stable face morphology and excellent function after 38 years [4]. A more recent study of 23 patients using modern Computer-Aided Design (CAD) and patient-specific titanium plates discovered that the majority of patients rated their global Health-Related Quality of Life (HRQoL) as good or better than before cancer, except chewing and appearance, which received lower scores [5]. These data show that, while structural and aesthetic restoration is possible, functional outcomes (chewing, speaking, saliva, and appearance) may be unsatisfactory, emphasising the importance of thorough rehabilitation and long-term follow-up.

In the present case, the patient underwent segmental mandibular excision followed by reconstructive surgery, after which physiotherapy and rehabilitation played a pivotal role in restoring jaw movement, chewing, speech, and swallowing- functions essential to oral health. This outcome aligns with the case reported by Wani S et al., where a 57-year-old male developed trismus three months after radiotherapy for jaw cancer. A four-week comprehensive physiotherapy program incorporating LASER therapy, mobilisation, myofascial release, and active exercises led to significant improvements in pain reduction, jaw mobility, and oral HRQoL. Collectively, these findings underscore the effectiveness of structured physiotherapy interventions in mitigating post-radiation complications and enhancing functional recovery in head and neck cancer patients [6].

A recent cross-sectional study found that while only ~24% of patients completed oral rehabilitation at the time of assessment, those who did reported higher subjective satisfaction and better implant survival rates [7]. This underlines the importance of combining reconstructive success with rehabilitation, prosthetic restoration, and psychosocial support to achieve full recovery. A meta-analysis demonstrated that exercise-based rehabilitation in Head and Neck Cancer (HNC) survivors yields modest improvements in functionality, particularly in reducing fatigue and enhancing lower limb strength among those treated with chemoradiotherapy. Similarly, in surgically treated patients, exercise interventions showed superiority in alleviating overall and shoulder pain, albeit with limited statistical significance. Despite these functional gains, no consistent evidence was found for improvements in quality of life across follow-up periods [8].

Given the rarity of jaw osteosarcomas and the variety of outcomes, each new case with extensive follow-up, such as ours, adds

valuable information to the literature. However, as recent studies have pointed out, more systematic data is required to build standardised rehabilitation regimens and long-term functional outcome assessments for OSJ patients.

## CONCLUSION(S)

This case emphasises the essential role of a structured multidisciplinary physiotherapy program in rehabilitating patients after mandibular reconstruction for osteosarcoma. Key interventions targeting jaw mobility, muscle strength, soft-tissue flexibility, speech, and psychosocial support led to significant improvements in functional outcomes, pain reduction, and psychological resilience. Integrating physical therapy into postoperative care is crucial for optimising recovery and enhancing long-term well-being. Early tailored rehabilitation not only boosts functional recovery but also aids psychological adaptation. Future protocols should focus on multidisciplinary collaboration to address both physical and psychosocial aspects of survivorship.

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