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Surgical strategy for long-standing dislocation of the temporomandibular joint: experience with 16 medically compromised patients

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Abstract

We evaluated the surgical outcomes in 16 patients with long-standing dislocation of the temporomandibular joint (TMJ): eight men and eight women, mean (range) age 72 (21-94) years. They all had multiple underlying diseases, either dementia or a mental disorder, and the joint had been dislocated for four weeks or longer. Manual reduction had been ineffective. They were operated on after assessments by the Department of Geriatric Medicine. The procedures were successful in 14 of the 16 patients: eminectomy (n = 5), eminectomy and discectomy or condylectomy (n = 2), eminectomy, discectomy, and condylectomy (n = 3), release of the lateral pterygoid muscle (n = 3), and curettage of a fibrotic scar in the mandibular fossa (n = 1). Reduction was "easy" (n = 4), "moderately difficult" (n = 3), or "very difficult" (n = 9). Complete reduction could not be achieved for two of the "very difficult" patients. After reduction, three patients had the mandibular condyle tethered to the mandibular fossa. Operation was successful in 12 of the 16 patients. Two patients died, one of cardiopulmonary arrest, and one of chronic pulmonary insufficiency, while reduction was incomplete in two. There were no recurrences. The difficulty of reducing the joint in most of our patients suggests that detailed preoperative surgical planning is essential, patients at risk should be carefully selected, and indications for techniques to prevent recurrence should be carefully evaluated.

Keywords: temporomandibular joint; long-standing dislocation; surgical management; medically compromised patients

Introduction

Treatment is more difficult for long-standing dislocation of the temporomandibular joint (TMJ) than for habitual dislocation.[1–4] However, no consistent set of treatment guidelines have been established for long-standing dislocation, possibly because fewer patients are treated for long-standing, than for habitual, dislocation. Many of the previously published studies comprise case reports of one or two patients, empirical reports with small samples, or reviews of published work.[5–9] In particular, we know of no systematic, large-scale studies. There have, however, been a few reports [2,3,5,7] that have described appropriate surgical methods, indications, and rates of improvement of symptoms in patients with long-standing dislocation of the TMJ.

We have investigated 16 patients with long-standing dislocation and, with the exception of a previous review of published reports, our study contains what we think is the largest number of such patients reported. We think that this

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Table 1
Patients' clinical and personal details.

Case No.	Age (years)	Sex (M/F)	Systemic disease	Side	Previous operations	Anticoagulant or antiplatelet agents
1	87	M	Intracranial haemorrhage, aspiration pneumonia, dementia	Both	-	-
2	94	M	Pneumonia, percutaneous endoscopic gastrostomy	Both	-	-
3	82	F	Alzheimer's disease, arteriosclerosis, dementia, percutaneous endoscopic gastrostomy	Both	-	-
4	67	F	Cerebral infarction, hydrocephalus, epilepsy	Left	-	-
5	91	F	Hypertension, chronic heart failure, atrial fibrillation, dementia	Both	-	-
6	74	F	Alzheimer's disease, cerebral infarction, epilepsy, angina pectoris	Both	-	-
7	85	M	Hypertension, cerebral infarction, arrythmia, aspiration pneumonia	Both	-	Warfarin potassium 2 mg
8	82	F	Hypertension, dementia	Both	-	Aspirin 100 mg
9	21	M	Traumatic epidural haematoma, cerebral infarction, spastic quadriplegia	Both	-	-
10	46	M	Myocardial infarction, diabetes mellitus, cerebral hypoxia	Both	Bilateral eminectomy	Aspirin 100 mg
11	76	M	Parkinson's disease, schizophrenia, cerebral hypoxia	Both	-	-
12	69	M	Carcinoma of stomach, cerebral infarction, dementia, diabetes mellitus	Both	-	-
13	86	F	Atrial fibrillation, angina pectoris, cerebral infarction	Both	-	-
14	66	F	Brain tumour, diabetes mellitus, dementia	Both	-	-
15	76	M	Schizophrenia, Alzheimer's disease, cerebral infarction	Both	Bilateral eminectomy	-
16	53	F	Cerebral palsy, stenosis of spinal canal, cervical spondylotic myelopathy	Both	-	-

study is useful, because it describes the validity of each procedure and provides potential countermeasures and points of caution when treating elderly patients with coexisting conditions (including dementia) the numbers of whom are rapidly increasing.

Patients and methods

We studied 16 patients with long-standing dislocation of the TMJ: eight male and eight female patients with a mean (range) age of 72 (21-94) years. All patients had multiple coexisting conditions, and either dementia or a mental disorder. Although detailed information about the period of dislocation was not available for each patient, the dislocated state had continued for at least four weeks, and manual reduction had been unsuccessful (Table 1). After general evaluation by the Department of Geriatric Medicine, they were operated on under either general or local anaesthesia,[10] depending on the indication. Two patients had previously had an eminectomy for recurrent habitual dislocation,[11–13] which had developed into long-standing dislocation. Three patients had been treated with anticoagulants or antiplatelet drugs for an underlying disease. Two of these three patients were operated on while continuing to take aspirin orally; the other patient, who had been taking warfarin, was operated on after a preoperative change from warfarin to heparin (Table 1).

All patients were treated by surgical reduction, which comprised eminectomy using a bone burr to remove 5-8 mm of the articular tubercle, as well as to ensure smoothness of the anterior slope that was in contact with the deviated mandibular condyle or the articular disc after release of the joint. Eminectomy was followed by repositioning of the mandibular condyle on to the mandibular fossa. If reduction was impossible, we did a discectomy or additional high condylectomy to achieve reduction,[5,14–16] depending on the circumstances. For patients whose dislocation was more difficult, we stripped the bone to achieve reduction by blindly releasing the connective tissue between the lateral pterygoid muscle and the medioanterior mandibular condyle. When the growth of fibrous tissue in the mandibular fossa presented a mechanical impediment to reduction of the mandibular condyle, we curetted the fibrotic scar. We therefore decided which technique could be used to enable reduction on the basis of these phased procedures. We also used additional techniques to prevent recurrence of dislocation, such as resection of the deformed part or recontouring, to establish the final surgical technique (Table 3).

Results

A single oral surgeon (NS) did all the operations, details of which are shown in Tables 1–3. Two patients went into cardiopulmonary arrest within eight hours postoperatively,

Table 2
Operations and outcomes.

Patient No.	Anaesthesia	Procedure	Operating time (min)	Difficulty of reduction	Reduction	Recurrence	Success/Failure
1	Local	L eminectomy + high condylectomy; R eminectomy	90	Difficult	Complete	-	Success
2	Local	L eminectomy, discectomy + high condylectomy; R eminectomy	145	Difficult	Incomplete		Failure
3	Local	L eminectomy, discectomy + high condylectomy; R eminectomy	105	Moderate	Complete	-	Success
4	Local	L eminectomy, discectomy + high condylectomy	30 m	Difficult	Complete	-	Success
5	Local	Bilateral eminectomy, discectomy + high condylectomy	90	Difficult	Complete	Fatal cardio-pulmonary arrest	Failure
6	Local	Bilateral eminectomy	130	Easy	Complete	-	Success
7	Local	L eminectomy; R eminectomy with high condylectomy	110	Easy	Complete	-	Success
8	Local	Bilateral eminectomy + high condylectoy	90	Moderate	Complete	-	Success
9	General	Bilateral eminectomy, discectomy + high condylectomy	155	Difficult	Incomplete		Failure
10	General	Bilateral eminectomy, discectomy + stripping of muscle	210	Difficult	Complete	-	Success
11	Local	Bilateral eminectomy + curettage of fibrotic scar	160	Difficult	Complete	-	Success
12	General	L eminectomy; R eminectomy, tethering + stripping of muscle	115	Difficult	Complete	-	Success
13	Local	Bilateral eminectomy, discectomy + high condylectomy	150	Easy	Complete	Cardio –pulmonary arrest	Failure
14	General	Bilateral eminectomy + tethering	130	Moderate	Complete	-	Success
15	General	Bilateral eminectomy, discectomy + stripping of muscle	90	Difficult	Complete	-	Success
16	General	Bilateral eminectomy + tethering	120	Easy	Complete	-	Success

Table 3
Distribution of procedures.

Reduction procedure	Number of patients	Patients using this procedure (case no.)
Eminectomy (including simple lateral rim shaving)	5	6, 7, 13, 14, 16
Eminectomy + condylectomy	2	1, 8
Eminectomy + discectomy + condylectomy	3	3, 4, 5
Eminectomy + discectomy + muscle stripping	3	10, 12, 15
Eminectomy + curettage (mandibular fossa)	1	11
Incomplete reduction	2	2, 9

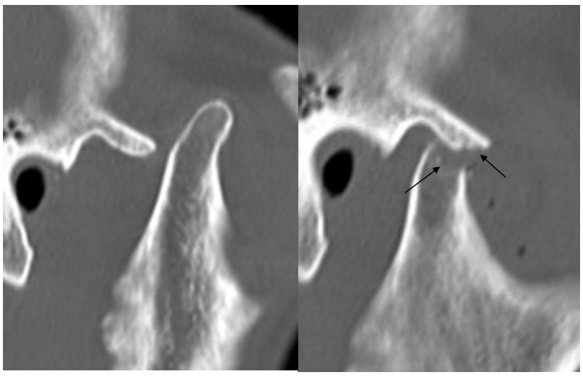

Fig. 1. Complete reduction (case 1) before (left) and after reduction (right) on computed tomographic scans of long-standing dislocation of the right temporomandibular joint. The arrows indicate bony surfaces after eminectomy and condylectomy.

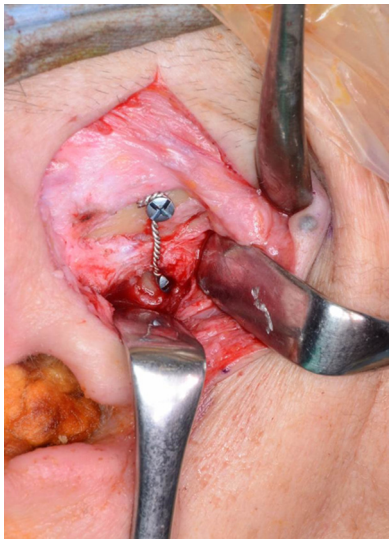

Fig. 2. Tethering of the right joint achieved by holding the condyle in the mandibular fossa (case 16). Two titanium screws, serving as anchors, are connected using a 0.5 mm stainless wire. One or two sets of this system are used for patients with recurrent dislocation.

and one of them died. The other patient required mechanical ventilation for about a year as a result of complications caused by hypoxic encephalopathy. The final surgical technique was eminectomy alone for a single patient. Of the other 15 patients, three had eminectomy and condylectomy (Fig. 1), and two eminectomy and tethering (Fig. 2);[17] one had an eminectomy and curettage of a fibrotic scar; and one

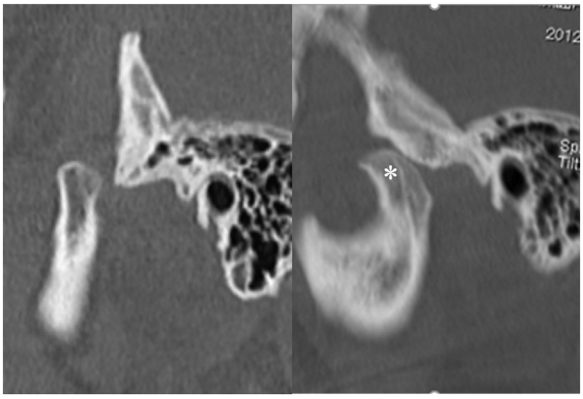

Fig. 3. Incomplete reduction (case 9). Before (left) and after (right) computed tomography scans of long-standing dislocation of the left temporomandibular joint. The condyle (*) is anterior to the mandibular fossa after eminectomy, discectomy, and condylectomy.

eminectomy, muscle release, and tethering (Table 2). Excluding the patient who died immediately postoperatively, the mean (range) follow-up period for the remaining 15 patients was 29 (6–72) months.

No recurrence developed in 12 patients, but the prognosis was poor in the remaining four, with incomplete reduction (Fig. 3) in two patients.

Discussion

In a discussion of published papers about surgical indications for patients with long-standing dislocation of the TMJ, Marqués-Mateo et al[3] reviewed some papers and concluded that the success rate for manual reduction and conservative treatment was 33%–54%. They suggested that 16%–54% of patients overall required open treatment. They also stated that the treatment should be established with the surgical goals of: first - reduction; secondly, functionality - normal occlusion; thirdly, minimal morbidity and complications (risk of ankylosis); and, finally, no recurrence.

We treated 16 patients with long-standing dislocation of the TMJ surgically. Indications were unsuccessful manual reduction and a dislocation that had persisted for four weeks or longer. The outcomes indicated that various aspects needed investigation, including decisions about the goals of treatment, selection of the surgical techniques in accordance with those goals, and considerations about complications. As two

patients went into cardiopulmonary arrest immediately after the operation (despite a general preoperative evaluation by a specialist) we propose that a short and minimally invasive operation that prioritises reduction alone should be done for high-risk patients with reduced ability to tolerate operation. The area should also be supported with a bandage, or other similar approach, after reduction, to prevent repeated dislocation. Although techniques to prevent recurrence should be used if possible, considering the patient's general condition we propose that this should be only a secondary goal. These proposals are consistent with the opinions stated by Marqués-Mateo et al.[3]

As far as the surgical techniques used for patients with long-standing dislocation of the TMJ are concerned, Wijmenga et al[2] reviewed a total of 40 patients, including three whom they directly oversaw, and found that closed reduction was successful in only eight, whereas condylectomy was the most common procedure in the 32 patients who were treated surgically. Gottlieb, Whinery, and Vero also recommended the use of condylectomy for such patients.[7–9] Caminiti and Weiberg,[6] however, used eminectomy for patients with long-standing dislocation of the TMJ, which is widely used for patients with habitual dislocation.[11–13]

Techniques that involve combinations of condylectomy, discectomy, and eminectomy have not been discussed elsewhere. Tipps et al[5] and Marqués-Mateo et al[3] reported one patient each who was treated by eminectomy combined with other techniques, (discectomy and condylectomy) for long-standing dislocation. These reports, which indicated that the techniques were successful, are the only descriptions of treatment currently available to our knowledge for such patients. Surgery involving eminectomy, discectomy, and condylectomy may therefore be effective for patients with long-standing dislocation of the TMJ.

We achieved reduction with eminectomy in five of the 16 patients, while combined discectomy or condylectomy was required in a further five. Curettage of fibrotic tissue in the mandibular fossa, release of the lateral pterygoid muscle, or another procedure was also required in four of the 16 patients. Multiple additional techniques were therefore required for many patients with long-standing dislocation of the TMJ to enable successful reduction. In addition, reduction was unsuccessful in two patients despite the use of multiple techniques, which suggests that additional surgical and non-invasive procedures,[9,18,19] such as intermaxillary fixation and intermaxillary traction, may be needed to enable complete reduction.

Our investigation of the level of difficulty of reduction showed that the procedure was easy in only four patients, moderately difficult in three, and very difficult in most patients (n = 9). In particular, reduction proved to be impossible intraoperatively in two patients. Because of this, the complementary use of additional non-invasive procedures must be considered.

Our investigation showed that when formulating a treatment strategy for patients with long-standing dislocation

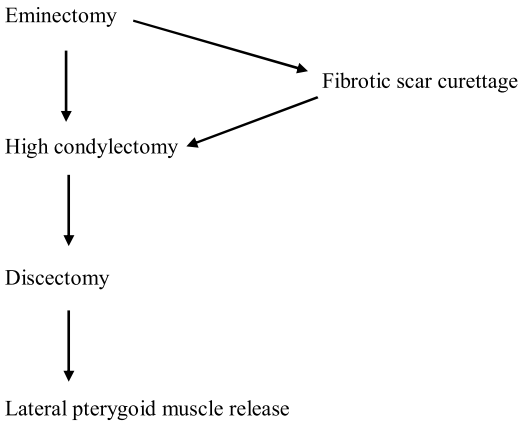

Fig. 4. Flow chart for treatment of long-standing dislocation of the temporomandibular joint with the aim of achieving condylar reduction. If there is fibrotic scarring after eminectomy, curettage of the fossa is needed. Additional condylectomy, or discectomy, or both, depends on the circumstances. Final stripping of the pterygoid muscle is blind.

(Fig. 4), manual reduction should be attempted, first under local anaesthesia and then under general anaesthesia. If reduction proves impossible, the joint should be released, followed by transection of the site of adhesions by eminectomy with reduction. If this is unsuccessful, discectomy and condylectomy will be required. Our results also indicated that, if necessary, release of the lateral pterygoid muscle or curettage of fibrotic tissue in the mandibular fossa may also be necessary. For patients in whom intermaxillary fixation or intermaxillary traction is possible, release of the lateral pterygoid muscle or curettage of fibrotic tissue in the mandibular fossa are recommended as complementary treatment.

Conflict of interest

We have no conflicts of interest.

Ethics statement/confirmation of patients' permission

Ethics approval was given by the Medical Research Ethics Committee of Kanazawa Medical University (reference number I251). Written consent was obtained from the patients to publish clinical photographs.

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References

1. Levy J, Bouloux G. Chronic temporomandibular joint dislocation. In: Matthews NS, editor. *Dislocation of the temporomandibular joint*. New York: Springer; 2018. p. 53–62.
2. Wijmenga JPH, Boering G, Blankestijn J. Protracted dislocation of the temporomandibular joint. *Int J Oral Maxillofac Surg* 1986;**15**: 380–8.
3. Marqués-Mateo M, Puche-Torres M, Iglesias-Gimilio ME. Tempromandibular chronic dislocation: the long-standing condition. *Med Oral Patol Oral Cir Bucal* 2016;**21**:e776–83.
4. Huang IY, Chen CM, Kao YH, et al. Management of long-standing mandibular dislocation. *Int J Oral Maxillofac Surg* 2011;**40**:810–4.
5. Tipps SP, Landis CF. Prolonged bilateral mandibular dislocation. *J Oral Maxillofac Surg* 1982;**40**:524–7.
6. Caminiti MF, Weiberg S. Chronic mandibular dislocation: the role of non-surgical and surgical treatment. *J Can Dent Assoc* 1998;**64**:484–91.
7. Gottlieb O. Long-standing dislocation of the jaw. *J Oral Surg* 1952;**10**:25–32.
8. Whinery JG. Bilateral condylar neck bisection for long-standing dislocation of the mandible: report of case. *J Oral Surg Anesth Hosp Dent Serv* 1961;**19**:432–5.
9. Vero D. Long-standing bilateral dislocation of the mandible in the elderly. *Int J Oral Maxillofac Surg* 1981;**10**(suppl 1):313–7.
10. Segami N. A modified approach for eminectomy for temporomandibular joint dislocation under local anesthesia: report on a series of 50 patients. *Int J Oral Maxillofac Surg* 2018;**47**:1439–44.
11. Myrhaug H. A new method of operation for habitual dislocation of the mandible – review of former methods of treatment. *Acta Odontol Scand* 1951;**9**:247–61.
12. Undt G. Temporomandibular joint eminectomy for recurrent dislocation. *Atlas Oral Maxillofac Surg Clin North Am* 2011;**19**:189–206.
13. Shorey CW, Campbell JH. Dislocation of the temporomandibular joint. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2000;**89**:662–8.
14. Dingman RO, Moorman WC. Meniscectomy in the treatment of lesions of the temporomandibular joint. *J Oral Surg* 1951;**9**:214–24.
15. Holmlund AB, Gynther GW, Kardel R, et al. Surgical treatment of temporomandibular joint luxation. *Swed Dent J* 1999;**23**:127–32.
16. Sanders B, Schneider J, Given J. Prolonged dislocation of the mandibular condyle: report of case. *J Oral Surg* 1979;**37**:346–8.
17. Segami N, Nishimura T, Miyaki K, et al. Tethering technique using bone screws and wire for chronic mandibular dislocation: a preliminary study of refractory cases. *Int J Oral Maxillofac Surg* 2018;**47**:1065–9.
18. Lee SH, Son SI, Park JH, et al. Reduction of prolonged bilateral temporomandibular joint dislocation by midline mandibulotomy. *Int J Oral Maxillofac Surg* 2006;**35**:1054–6.
19. Warren RE, Weinberg S, Van de Mark TB. Prolonged traumatic dislocation of the mandible. *J Oral Surg* 1974;**32**:535–7.