

Clinicoradiological evaluation of dermis-fat grafts after temporomandibular joint discectomy: A retrospective study

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ABSTRACT

Purpose: The aim of this study was to compare the preoperative and 1-year postoperative clinical and radiological findings of the patients after unilateral temporomandibular joint (TMJ) discectomy with inter-positional abdominal dermis-fat graft. **Materials and Methods:** Fourteen patients underwent unilateral discectomy and dermis-fat grafting between 2008 and 2010. Preoperative and 1-year postoperative clinical parameters such as maximum mouth openings (MMO) and lateral movements (LM) of the mandible were recorded. Additionally, preoperative and postoperative magnetic resonance imaging was obtained to determine the duration of operated TMJs. **Results:** All of the 14 patients showed the improvement in mandibular mobility and function. There was a significant increase in the MMO and LM during the follow-up period. Pain levels at follow-up were significantly lower than the preoperative levels. Radiologically, the dermis-fat graft was detected within the joint or surrounding the condyle in all 14 operated joints. The graft material that was found within the joint space was mainly grey in four joints. Ten joints showed heterogeneous material composed of fat interspersed with grey tissue. **Conclusion:** Discectomy and dermis-fat grafting appears to be a successful surgical option regarding to the clinical parameters. However, summed degenerative changes depending on surgical operation should be retained.

Key words: Dermis-fat grafting, temporomandibular joint, discectomy

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INTRODUCTION

Internal derangement of the temporomandibular joint (TMJ) denotes an abnormal positional relationship of the disc relative to the mandibular condyle and the glenoid fossa which is accompanied with TMJ pain, abnormal sounds, muscle tenderness, and limitation

of mouth opening.^[1] Discectomy of the TMJ has been used in the surgical management of the severe internal derangement for many years.^[2-4] However, Agerberg *et al.* and Hansson *et al.* reported the structural changes in the condylar morphology subsequent to the discectomy.^[5,6] To avert this degenerative effect, a barrier that acts as an original disc should have been used. In the last half century, numerous attempts have been made to replace the missing disc with alloplastic implants such as Teflon-Proplast and Silastic and autogenous grafts such as temporalis muscle fascia, ear cartilage, and dermis but with limited success.^[2] The abdominal dermis-fat graft was first introduced to TMJ surgery by Dimitroulis^[7] who used it as an interpositional graft after gap arthroplasties for TMJ ankylosis. Same author used it as interpositional

Access this article online	
Quick Response Code: 	Website: www.njms.in
	DOI: 10.4103/0975-5950.102152

material after TMJ discectomy with good results.^[8] However, there is still a question that can satisfy dermis-fat grafts of the needs for the integrity of the joint. In this retrospective study, it was aimed to show the efficacy of unilateral discectomy and dermis-fat grafting in the management of severe TMJ internal derangement by evaluation of clinical parameters and magnetic resonance imaging (MRI) findings in 1 year follow-up period.

MATERIALS AND METHODS

This retrospective study involved 14 patients (four male patients) who had undergone unilateral discectomy and dermis-fat grafting for the management of severe internal derangement. It was permitted for this study by the Ethic Committee of Fatih University Hospital. The age range of the patients in this study was from 19 to 52 years, with a mean age of 34 years. All patients had the history of failed conventional treatment, such as arthrocentesis and splint therapy. There were 9 left and 5 right joint surgeries. Each patient had undergone TMJ discectomy with immediate dermis-fat graft placement within the resultant joint space [Figures 1 and 2]. The dermis-fat graft was procured from the lower abdomen through an elliptical incision that was primarily closed. The covering epidermis was removed freehand by sharp dissection with a scalpel blade and discarded. The dermis-fat graft was trimmed and passively placed into the joint cavity to fill the whole space, and the surrounding capsule sutured to hold the graft in place.^[7,8] All surgeries were performed by the same surgeon under general anesthesia and MRI evaluations were made by the same radiologist.

All patients have been followed for one year at least. Maximum mouth openings (MMO), the size of the

lateral mandibular movements and pain scores (10 cm lined vas scale) were recorded preoperatively and 1 week, 1 month, 3 months, 6 months, and 1 year postoperatively. All patients were scanned before and 1 year after therapy with a 1.5 T MRI scanner (Achieva; Philips Medical Systems, Best, Netherlands) using a multichannel head coil. Both joints were imaged in all patients. First, an axial scout section was used to localize the mandibular condyle. Then, oblique sagittal T1-weighted spin echo (SE) sequences were acquired (repetition time [TR]: 450 msec, echo time [TE]: 15 msec, matrix: 180 × 320, slice thickness: 3 mm, field of view [FOV]: 130 mm, number of excitation [NEX]: 3) in closed mouth position. Eight sagittal images for each joint were obtained. Then, oblique sagittal T1 3-dimensional water only WATS images (TR: 30 msec, TE: 3.9 msec, matrix: 180 × 256, slice thickness: 1 mm, FOV: 130 mm, NEX: 3, FA: 20°) were acquired in closed mouth position. Twenty-five images were acquired for each TMJ. Finally, oblique sagittal T2-weighted fast spin echo (FSE) images (MOVIE) (TR: 131 msec, TE: 14 msec, matrix: 240 × 192, slice thickness: 3 mm, FOV: 160 mm, NEX: 1, FA: 30°) were acquired in six different mouth opening positions. The patients have been instructed to open their mouth gradually.

Statistical analysis

SPSS for Windows 11.5 program was used for the analysis of the data. Closes of the dispersions of the continuous variants to the normal were determined by Shapiro-Wilk test. Descriptive statistics for mouth opening were showed by mean ± standard deviation and pain levels were showed by median. Mouth openings were evaluated by variance analysis and pain levels were evaluated by Friedman test. Bonferroni correction was applied to control the type 1 fault of possible multiple comparison.



Figure 1: TMJ discectomy published with the patient's consent



Figure 2: The dermis-fat graft within the joint space published with the patient's consent

RESULTS

Clinical findings

All patients tolerated with the procedure well. No complications were noted during or after the surgery. The main preoperative complaints were that the patients were in pain and limited mouth opening. Postoperatively, VAS pain scores had been decreased significantly during the follow-up period [Table 1]. Patients indicated that they had desirable mouth opening and mandibular movements by the second month on average. MMO measurements initiated to increase postoperatively in the first month. However, there were no statistically differences among the postoperative cycles' measurements [Table 2]. Procedure was reduced to the tenderness of TMJ and muscles according to the resolution of the pain in TMJ by the first month and it remained in the follow-up period. Two of the 14 patients had claimed of primary occlusal contact on the operated side and these were remained at the end of the postoperative one-year follow-up period. One patient complained of crepitus on the operated side and it remained in one year after the operation.

Radiological findings

Before the application of therapy, MRI showed limited condylar motion of one side and anterior displacement

Table 1: Preoperative and post operative VAS pain scores

Examination periods	VAS pain scores
Preop	7 (6-9)
Postop 1 Week	7 (6-8)
Postop 1 Month	3 (2-5) ^{A B}
Postop 3 Month	1 (1-2) ^{A B C}
Postop 6 Month	1 (1-2) ^{A B C}
Postop 12 Month	1 (1-2) ^{A B C}

A. There is a significant statistical difference from the preoperative scores ($P < 0.001$),
 B. There is a significant statistical difference from the 1-week scores ($P < 0.001$),
 C. There is a significant statistical difference from the 3-month scores ($P < 0.001$)

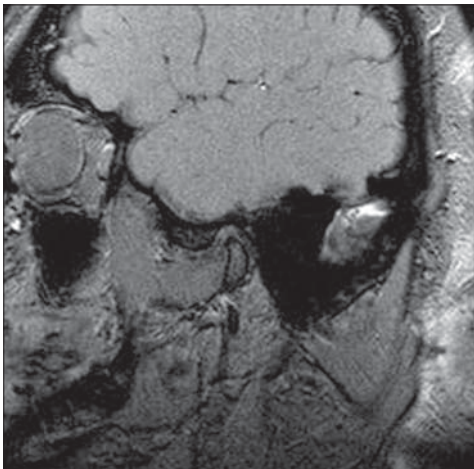


Figure 3: The MR image of the TMJ showing the heterogeneous material composed of fat interspersed with grey tissue

of TMJ disc without reduction in all patients. All patients showed radiologically normal condyles on their preoperative MRIs. The radiological presence of fat was found within the joint or surrounding the condyle in all 14 operated joints. The graft material found within the radiologically defined joint space was mainly grey (probably fibrotic or granulation tissue) in four joints. Ten joints showed heterogeneous material composed of fat interspersed with grey tissue [Figure 3].

There were hypointensities probably consistent with fibrotic tissue in retrodiscal space in a patient who had a complaint of crepitus in her operated TMJ. It was observed that the graft had relocated into the retrodiscal region [Figure 4]. One year after the operation, dynamic MRI demonstrated increased range of both condylar motions.

DISCUSSION

Surgery for the management of internal derangement of the TMJ is usually determined after failed conventional treatment methods, such as arthrocentesis and occlusal splint therapy. Surgical procedures, grafting methods, and those advantages and disadvantages have been well documented in the literature.^[9,10]

Table 2: Preoperative and postoperative mouth openings

Examination period	Mouth opening
Preop	26,3 ± 4,1 ^{A B C D}
Postop 1 Month	40,7 ± 2,6 ^A
Postop 3 Month	41,1 ± 2,7 ^B
Postop 6 Month	40,9 ± 2,4 ^C
Postop 12 Month	41,4 ± 3,1 ^D

A: There is a significant difference between preoperative and postoperative 1-month cycles ($P < 0.001$), B: There is a significant difference between preoperative and postoperative 3-month cycles ($P < 0.001$), C: There is a significant difference between preoperative and postoperative 6-month cycles ($P < 0.001$), D: There is a significant difference between preoperative and postoperative 12-month cycles ($P < 0.001$)



Figure 4: The hypointensities probably consistent with fibrotic tissue in retrodiscal space in a patient who had a complaint of crepitus in her operated TMJ

Discectomy and additional procedures such as dermis-fat grafting has achieved in popularity to discoplasty procedures.^[2-4] Dimitroulis introduced the abdominal dermis-fat graft to TMJ surgery and showed that it was a safe and useful interpositional graft for the management of TMJ ankylosis. In addition to this surgical evidence, Dimitroulis showed the positive outcomes of discectomy and dermis-fat grafting in terms of reduced pain levels and improved jaw function.^[1] However, it is controversial that the procedure can respond to all the expectations for the management of the internal derangement.^[2] As far, we observed that there were only Dimitroulis's studies which have showed the effect of discectomy and dermis-fat grafting in the literature.^[8,11] However, clinical and radiological findings of discectomy without interpositional grafting were observed by different authors.^[3,4,6,10]

In our study, the graft material found within the radiologically defined joint space was mainly grey (probably fibrotic or granulation tissue) in four joints and 10 joints showed heterogeneous material composed of fat interspersed with grey tissue. Dimitroulis *et al.* also detected the grey interpositional material in 71% of their cases and they reported that it could represent fibrotic scar or granulation tissue.^[11] The results of histological study of the same author supplied with explaining the composition of the grey material found in the joint space on MRI.^[12] The histological examination of the dermis fat graft demonstrated extensive collagen fibers that were interspersed with islands of mature adipose tissue and remnants of dermal elements such as sweat glands and hair follicles. The results of the Dimitroulis' histological study indicate that the dermis-fat graft undergoes increased fibrotic changes over time in response to the functional demands of the joint environment which it occupies.^[12]

MRI was preferred to assess the effects of the procedure to the TMJ in this study and it is also preferred imaging the modality for the heterogeneous group of TMJ disorder patients. The standard imaging protocol consist of oblique sagittal and oblique coronal images of the TMJ that are obtained perpendicular and parallel to the long axis of the mandibular condyle.^[13,14] The disc position and morphology, as well as the bone structures, are clearly visualized on the closed mouth images. The function of the disc and the condyle can usually be assessed on the open mouth images.^[15]

The follow-up period according to the surgery to the TMJ usually ranges from 2 months to 10 years in the literature.^[10,12-16] Follow-up period of the present study was planned according to the literature. One-year follow-up period is significant to observe the early findings of the procedure.

Discectomy and dermis-fat grafting showed the successful improvement of mandibular motion and pain in this present study. According to the statistical analysis of mandibular motion measurements and VAS pain scores, there were significant differences in comparison of the preoperative and postoperative 1-year findings. The successful outcomes of the discectomy and dermis-fat grafting in this study were appropriate to the literature.^[7,8,17]

One of the 14 patients claimed of crepitus after the procedure and the crepitus was remained for 1 year after the surgery. According to the MRI investigation, we observed that the graft had relocated into the retrodiscal tissue. Grafting technique is that the dermis-fat graft is placed in the joint after discectomy and graft fills the whole space of the joint. It can be sutured to the upper part of the incised joint capsule. However, the rigidity of the sutures may not be sufficient that the graft can relocate into the undesirable regions of the joint. Milora and Henriksen reported crepitus in their patients who underwent discectomy of the TMJ without grafting.^[10] Whilst the literature clearly points to the long-term success of TMJ discectomy without grafting, there is still concern about the crepitus and regressive remodeling that takes place in the condyle.^[18] In the present study, relocated graft did not act as a barrier and crepitus might be appeared such as a result of the discectomy without grafting.

Two patients specified primary occlusal contact on their operated sides and these findings remained in the 1-year follow-up period. Corruption of the articular integrity by excision of the disc and grafting the whole space by a different tissue effects of the widening of the operated joint space.^[19] Common traumatic events include those that cause over the extension of the mandible, such as prolonged maximal opening during a dental procedure, endotracheal intubation, or yawning.^[20] Micro-trauma that causes in a soft tissue response, such as plastic deformation of the ligaments, may also lead to permanent intra-articular changes that can have long-term consequences.^[21,22] Occlusal changes might occur according to the traumatic effects of the operation or volumetric changes caused by the excision of the disc.

There were no condylar resorptions in patients before the operation according to the MRI findings. Postoperative 1 year MRI also did not show any degeneration of the condyles and other articular tissues. Increased mandibular motion without pain in all patients was the successful outcome of the procedure. Regarding to the clinical success and MRI findings, procedure is assessed to be applicable for the management of the internal derangement of the TMJ.

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How to cite this article: Candirli C, Esen A, Taskesen F, Celik S, Cakir B. Clinoradiological evaluation of dermis-fat grafts after temporomandibular joint discectomy: A retrospective study. *Natl J Maxillofac Surg* 2012;3:42-6.

Source of Support: Nil. **Conflict of Interest:** None declared.