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Original Research

Comparison of Three Joint Surgeries for Temporomandibular Joint Internal Derangements: A Retrospective Outcome Analysis

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ABSTRACT:
Background: Temporomandibular joint (TMJ) internal derangements are common sources of facial pain and dysfunction. This retrospective study aims to compare the outcomes of three surgical interventions for TMJ internal derangements, namely arthrocentesis, arthroscopy, and open joint surgery. **Methods**: A total of 300 patients diagnosed with TMJ internal derangements were included in this study. They were divided into three groups based on the surgical intervention received. Clinical and radiographic data were collected and analyzed. Pain reduction, functional improvement, and complications were evaluated as primary outcomes. **Results**: The results indicate that arthroscopy and open joint surgery yielded significantly better outcomes in terms of pain reduction and functional improvement compared to arthrocentesis. Arthroscopy demonstrated the highest success rate in reducing pain and restoring jaw function. Complications were minimal across all three groups. **Conclusion:** In conclusion, this retrospective study demonstrates that arthroscopy and open joint surgery are superior to arthrocentesis in the management of TMJ internal derangements, leading to significant pain reduction and improved jaw function. Our results underscore the importance of considering these surgical options when determining the most appropriate treatment for patients with TMJ internal derangements.
Keywords: Temporomandibular joint, internal derangements, arthrocentesis, arthroscopy, open joint surgery, retrospective study.

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INTRODUCTION

Temporomandibular joint (TMJ) internal derangements represent a challenging and often debilitating subset of temporomandibular joint disorders. These conditions encompass a spectrum of pathological changes within the TMJ, including disc displacement, joint effusion, and condylar abnormalities, which collectively contribute to a wide array of clinical symptoms such as pain, restricted jaw movement, joint noises, and compromised oral function [1-3]. The multifaceted nature of TMJ internal derangements poses diagnostic and therapeutic complexities, necessitating a thorough understanding of the underlying mechanisms and an

evidence-based approach to treatment. The temporomandibular joint, situated bilaterally in the craniofacial region, plays a pivotal role in mastication, speech, and facial expression. Any disruption or dysfunction within this intricate joint system can lead to significant patient discomfort and impairment of daily activities. As such, the management of TMJ internal derangements remains a critical concern in the field of oral and maxillofacial surgery, demanding careful consideration of various treatment modalities to alleviate pain, restore function, and enhance the patient's overall quality of life [4-6]. Historically, the management of TMJ internal derangements has followed an evolving paradigm, transitioning from conservative approaches to more invasive surgical interventions. Initial treatment strategies typically involve non-surgical methods, including pharmacotherapy, physical therapy, splint therapy, and lifestyle modifications [2, 7-10]. These conservative measures aim to alleviate symptoms, improve joint function, and mitigate pain. However, a significant proportion of patients experience limited or no relief with these non-invasive interventions, leading to the consideration of surgical options.The surgical armamentarium for TMJ internal derangements includes three primary procedures: arthrocentesis, arthroscopy, and open joint surgery. Arthrocentesis, characterized by its minimally invasive nature, involves the irrigation and lavage of the TMJ space with the aim of reducing inflammation and removing debris [3]. Arthroscopy, on the other hand, offers a minimally invasive visualization and intervention option, enabling precise examination and treatment of intra-articular pathology through small incisions [4]. Lastly, open joint surgery encompasses more invasive techniques such as disc repositioning or replacement, condylar shaving, and various joint reconstruction procedures, which aim to address structural abnormalities within the TMJ [5]. The selection of the most appropriate surgical intervention should be tailored to the individual patient's clinical presentation, radiographic findings, and the surgeon's expertise. Despite the extensive utilization of these surgical modalities, there exists a notable dearth of comprehensive comparative studies evaluating their respective efficacy and outcomes in the management of TMJ internal derangements. The absence of clear guidelines regarding the optimal choice of surgical intervention highlights the need for evidence-based research to inform clinical decision-making. Furthermore, the evolution of minimally invasive techniques such as arthroscopy has introduced new considerations and challenges in the selection of surgical approaches for TMJ internal derangements. As such, this retrospective study endeavors to address these knowledge gaps by conducting a rigorous analysis and comparison of the outcomes associated with arthrocentesis, arthroscopy, and open joint surgery in a substantial cohort of patients diagnosed with TMJ internal derangements. By systematically evaluating these surgical approaches and their impact on patient-reported outcomes, pain relief, functional restoration, and postoperative complications, our study aims to provide valuable insights for clinicians, surgeons, and patients alike. This research contributes to the ongoing dialogue surrounding the optimal management of TMJ internal derangements and strives to improve the quality of care delivered to individuals grappling with these challenging conditions. Through meticulous examination of existing literature, clinical data, and patient experiences, we endeavor to shed light on the comparative effectiveness of these surgical interventions, facilitating evidence-based decision-making in the quest to alleviate the burden of TMJ internal derangements on the lives of those affected.

MATERIALS AND METHODS

Study Design: This retrospective study was conducted to compare the outcomes of three surgical interventions—arthrocentesis, arthroscopy, and open joint surgery—in the management of patients diagnosed with temporomandibular joint (TMJ) internal derangements. The study was carried out in accordance with the principles outlined in the Declaration of Helsinki and approved by the Institutional Review Board (IRB). Informed consent was obtained from all patients.

Patient Selection: A comprehensive review of medical records was performed to identify patients who underwent surgical interventions for TMJ internal derangements at our institution between 2015-2021. Inclusion criteria encompassed patients aged 18 to 65 years, a confirmed diagnosis of TMJ internal derangements based on clinical evaluation, imaging studies (e.g., magnetic resonance imaging or computed tomography), and a failure to achieve satisfactory symptom relief through conservative treatments. Exclusion criteria included patients with a history of TMJ surgery, systemic medical conditions affecting the TMJ, and incomplete medical records. Surgical Interventions: The three surgical groups were defined as follows: Arthrocentesis (Group A): Patients who underwent TMJ arthrocentesis, a minimally invasive procedure involving the introduction of sterile saline solution into the joint space followed by its irrigation and lavage. Arthrocentesis was performed using established techniques [3]. Arthroscopy (Group B): Patients who underwent TMJ arthroscopy, a minimally invasive procedure enabling direct visualization and treatment of intra-articular pathology through small incisions. Arthroscopic procedures were carried out by experienced oral and maxillofacial surgeons [4].

Open Joint Surgery (Group C): Patients who underwent open joint surgery, which included procedures such as disc repositioning or replacement, condylar shaving, and joint reconstruction. The choice of specific open joint surgery was based on the

surgeon's clinical judgment and the nature of the internal derangement [5].

Data Collection: Patient demographic information, including age and gender, was collected from medical records. Clinical data encompassed preoperative and postoperative pain scores, maximum mouth opening (MMO), and lateral excursions. Pain scores were assessed using validated pain assessment scales such as the Visual Analog Scale (VAS) or Numeric Rating Scale (NRS). MMO and lateral excursions were measured in millimeters. Radiographic data, including preoperative and postoperative imaging (e.g., MRI or CT scans), were reviewed to assess joint morphology, disc position, and any anatomical abnormalities. Postoperative complications such as infection, hematoma, or facial nerve injury were also recorded.

Statistical Analysis: Statistical analysis was performed using appropriate software (SPSS ver 20). Descriptive statistics, including means, standard deviations, and percentages, were used to summarize demographic and clinical data. Analysis of variance (ANOVA), chi-square tests were employed to compare baseline characteristics among the three surgical groups. Outcome Measures: The primary outcome measures included pain reduction, improvement in MMO, and lateral excursions, which were assessed preoperatively and at postoperative follow-up appointments. Secondary outcome measures comprised postoperative complications and the need for additional surgical interventions. Results were considered statistically significant at a p-value of less than 0.05. Sample Size: The study aimed to include a total of 300 patients, with approximately 100 patients in each of the three surgical groups (arthrocentesis, arthroscopy, and open joint surgery).

Ethical Considerations: This study strictly adhered to ethical guidelines, maintaining patient confidentiality and privacy throughout the data collection and analysis process. This comprehensive methodology enabled us to investigate and compare the outcomes of arthrocentesis, arthroscopy, and open joint surgery for TMJ internal derangements while ensuring rigorous ethical and scientific standards were upheld. The subsequent analysis and results are discussed in detail in the following sections.

RESULTS

Demographic characteristics, including age and gender, were comparable among the three surgical groups ($p > 0.05$). This suggests that patient age and gender distribution did not significantly influence the selection of the surgical procedure. Table 1: All surgical groups demonstrated a significant reduction in pain scores (VAS) following surgery ($p < 0.001$). However, the reduction was more substantial in the arthroscopy and open joint surgery groups compared to arthrocentesis, indicating superior pain relief with the more invasive procedures. Table 2 :All surgical groups exhibited a statistically significant increase in MMO and lateral excursions (LE) following surgery ($p < 0.001$). The open joint surgery group demonstrated the most substantial improvements in MMO and LE, followed by arthroscopy and arthrocentesis. Table 3 :Postoperative complications were observed in all three surgical groups, with infection being the most common in the arthrocentesis group and hematoma in the open joint surgery group. The need for additional surgeries was minimal, with the arthrocentesis group requiring the highest number. Table 4

Table 1: Demographic Characteristics of Study Participants

Characteristic	Arthrocentesis (Group A)	Arthroscopy (Group B)	Open Joint Surgery (Group C)
Total Participants	100	100	100
Age (Mean ± SD)	37.2 ± 8.5	38.5 ± 9.2	36.8 ± 8.9
Gender (Male/Female)	43/57	45/55	40/60

Table 2: Preoperative and Postoperative Pain Scores (VAS)

Surgical Group	Preoperative VAS (Mean ± SD)	Postoperative VAS (Mean ± SD)
Arthrocentesis (A)	7.6 ± 1.2	2.3 ± 0.9
Arthroscopy (B)	7.8 ± 1.0	1.6 ± 0.7
Open Joint Surgery (C)	7.9 ± 1.1	1.3 ± 0.6

Table 3: Maximum Mouth Opening (MMO) and Lateral Excursions (LE)

Surgical Group	Preoperative MMO (Mean ± SD)	Postoperative MMO (Mean ± SD)	Preoperative LE (Mean ± SD)	Postoperative LE (Mean ± SD)
Arthrocentesis (A)	26.4 ± 4.3	34.5 ± 3.9	6.8 ± 1.2	9.3 ± 1.1
Arthroscopy (B)	27.2 ± 4.0	38.6 ± 3.7	6.7 ± 1.0	10.1 ± 1.2
Open Joint Surgery (C)	27.1 ± 4.2	40.2 ± 3.8	6.9 ± 1.1	10.5 ± 1.0

Table 4: Postoperative Complications and Additional Surgeries

Surgical Group	Complications (n)	Additional Surgeries (n)
Arthrocentesis (A)	2 (Infection)	4
Arthroscopy (B)	1 (Hematoma)	3
Open Joint Surgery (C)	3 (Facial nerve injury, Hematoma)	2

DISCUSSION

The management of temporomandibular joint (TMJ) internal derangements remains a complex and evolving field within oral and maxillofacial surgery. This retrospective study sought to compare the outcomes of three surgical interventions—arthrocentesis, arthroscopy, and open joint surgery—in patients diagnosed with TMJ internal derangements. The findings provide valuable insights into the relative efficacy and considerations associated with these surgical modalities.

Pain Relief and Functional Improvement: Pain reduction and functional improvement are paramount considerations in the evaluation of surgical interventions for TMJ internal derangements. Our study demonstrated that all three surgical groups experienced a significant reduction in pain scores following surgery, underscoring the efficacy of these interventions in alleviating pain associated with TMJ internal derangements. However, notable differences emerged among the surgical approaches [11-13]. Arthroscopy and open joint surgery exhibited superior outcomes in terms of pain reduction compared to arthrocentesis. This finding aligns with prior research, highlighting the effectiveness of arthroscopic techniques in addressing intra-articular pathology and providing substantial pain relief [12-16]. Open joint surgery, as the most invasive approach, yielded the most significant pain reduction. This result is consistent with the extensive nature of open joint surgery, which allows for comprehensive management of structural abnormalities, including disc repositioning or replacement and condylar shaving [15]. These findings underscore the notion that more invasive surgical options tend to offer greater pain relief. Moreover, the improvements in maximum mouth opening (MMO) and lateral excursions (LE) observed in our study further support the superiority of arthroscopy and open joint surgery in enhancing functional outcomes. An increase in MMO and LE is indicative of improved jaw mobility, enabling patients to regain better oral function and quality of life. Open joint surgery, in particular, demonstrated the most substantial improvements in MMO and LE. This outcome is in line with previous research emphasizing the capacity of open joint surgery to address structural abnormalities and restore optimal joint function [15].

Postoperative Complications: Postoperative complications are an important aspect to consider when evaluating surgical interventions for TMJ internal derangements. In our study, complications were observed in all three surgical groups, with varying types and frequencies. Arthrocentesis was associated with a relatively low rate of complications, primarily limited to infection, which is consistent with the minimally invasive nature of the procedure. Arthroscopy had a similar low complication rate, with hematoma being the most common complication [16-18]. Open joint surgery, on the other hand, exhibited a slightly higher incidence of complications, including facial nerve injury and hematoma. While these complications are concerning, it's essential to recognize that open joint surgery is more invasive and involves greater manipulation of the TMJ structures. The observed complications should be weighed against the significant pain relief and functional improvement achieved with this approach. Additionally, the low incidence of complications in all groups suggests that these surgical procedures, when performed by experienced surgeons and with appropriate patient selection, can be carried out with a relatively low risk of adverse events.

Additional Surgeries: The need for additional surgeries post-TMJ surgery is another crucial aspect to consider. Our study revealed that patients in all three surgical groups required additional surgeries, albeit in relatively small numbers. The arthrocentesis group had the highest need for additional surgeries, likely due to the minimally invasive nature of the initial procedure. Patients who initially received arthrocentesis may have required subsequent surgeries to address unresolved issues or evolving pathology. This finding emphasizes the importance of careful patient selection and shared decision-making when choosing arthrocentesis as the primary intervention [15-20].

Clinical Implications: The findings of this study have significant clinical implications for the management of TMJ internal derangements. While arthrocentesis remains a viable option for some patients, particularly those with less severe derangements or as a conservative initial approach, arthroscopy and open joint surgery emerged as more effective interventions for cases requiring significant pain relief and functional improvement. The choice between these two approaches should be guided by factors such as the severity of internal derangement, the presence of structural abnormalities, and the patient's individual needs and preferences.It is essential to emphasize that the decision to pursue open joint surgery should be made judiciously, considering the associated risks and benefits. Open joint surgery's invasive nature and potential for

complications necessitate careful patient selection, thorough preoperative evaluation, and skilled surgical expertise. Patients should be well-informed about the procedure, its potential outcomes, and the need for postoperative rehabilitation.

Limitations and Future Directions: Several limitations should be acknowledged when interpreting the results of this study. First, the retrospective design introduces inherent biases, and the lack of randomization may influence patient selection and outcomes. Second, the relatively short follow-up duration may not capture long-term outcomes and complications. Future research should include longer-term follow-up to assess the durability of pain relief and functional improvements. Additionally, this study focused on a single institution's experience, and variations in surgical techniques and patient populations may exist across different centers. A multi-center, prospective study with a larger sample size could provide more comprehensive insights into the comparative effectiveness of these surgical interventions.

CONCLUSION

In conclusion, this retrospective analysis highlights the varying outcomes associated with arthrocentesis, arthroscopy, and open joint surgery in the management of TMJ internal derangements. Arthroscopy and open joint surgery demonstrated superior pain relief and functional improvements but were also associated with a slightly higher incidence of complications. Patient selection and individualized treatment planning are crucial in guiding the choice of surgical intervention. This study contributes to the evolving understanding of TMJ internal derangement management and underscores the importance of balancing the benefits and risks associated with each surgical approach to optimize patient outcomes. Further research, including prospective and long-term studies, is needed to refine treatment guidelines and enhance our understanding of these complex disorders.

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