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Clinical Study

TMJ Disorders

Comparison of the outcomes of three surgical treatments for end-stage temporomandibular joint disease

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Abstract. The aim of this study was to determine whether there are any differences between condylectomy, rib grafts, and prosthetic joints (Biomet TMJ stock prosthesis) with regard to outcomes for patients with end-stage temporomandibular joint (TMJ) disease. Fifty-six of a total 127 patients who presented with category 5 end-stage TMJ disease over 3 years (2010–2013) agreed to participate in this retrospective, comparative, cohort study. Patients were divided into four groups: preoperative ($n = 16$), condylectomy ($n = 8$), rib graft ($n = 16$), and prosthetic joint ($n = 16$). They were assessed for major postoperative complications (i.e., return to theatre) and maximum range of mandibular motion, and all completed a specific quality of life (QOL) questionnaire. Whilst the condylectomy group demonstrated the best mandibular range of motion ($P < 0.01$), rib graft patients were more likely to experience complications (43.8%) necessitating a return to theatre. The prosthesis group recorded the best mean aggregate QOL score, but the difference compared to the rib graft and condylectomy groups was not statistically significant. The results of this study suggest that for dentate patients, prosthetic joints are highly dependable with no returns to theatre and favourable QOL outcomes. For edentulous patients, condylectomies alone also appear to work well. Future TMJ prosthetic designs should focus on improving mandibular range of motion, as the current stock prosthesis allows only a restricted range, no better than that achieved with rib graft ($P > 0.05$) and far less than that achieved with condylectomy ($P < 0.01$).

Keywords: temporomandibular joint; osteoarthritis; condylectomy; rib graft; TMJ prosthesis.

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The surgical management of end-stage temporomandibular joint (TMJ) disease has improved progressively with the introduction of sophisticated imaging techniques and the evolution of prosthetic total joint replacement (TJR) systems that are reliable, durable, and effective in restoring mandibular function.[1] The recent introduction of a new surgical classification[2] (Table 1) provides researchers and clinicians with a new description of end-stage joint disease termed category 5 TMJ, which refers to catastrophic changes to the joint as a result of which none of the joint components can be salvaged. It is the category 5 TMJs[2] that the field of TJR surgery aims to address, so it is incumbent on the manufacturers of TJR

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Table 1. TMJ surgical classification as proposed by Dimitroulis (2013). All 56 patients involved in this study had category 5 joints.

Category 1	TMJ normal
Category 2	TMJ minor changes (all components salvageable)
Category 3	TMJ moderate changes (mostly salvageable)
Category 4	TMJ severe changes (partly salvageable)
Category 5	TMJ catastrophic changes (nothing is salvageable)

systems that in addition to engineering, laboratory, animal, and cadaveric studies, clear clinical evidence is also sought to establish the real advantages of prosthetic joints over other alternatives.

The steady growth of TMJ prosthetic TJRs has prompted many centres around the world to publish their experiences.[3–9] More often than not, the experiences published are positive.[5,7,8] Unfortunately, in our keen determination to show the world the benefits of prosthetic TJR systems, there is little hard evidence to show that prosthetic joints are in fact better than the age-old condylectomy (no reconstruction) and costochondral rib graft, which are now largely confined to developing nations. As our experiences with TJR systems gather momentum, we need to pause for a moment and take stock of which direction we need to take with future design improvements in existing TJR systems. The only way to achieve this is to begin by looking at the real (as opposed to imagined) advantages of existing TJR systems over the older techniques of condylectomies and rib grafts. The aim of this study was to determine if there are any differences between condylectomy, rib grafts, and prosthetic joints with regard to surgical outcomes for patients with category 5 TMJ end-stage joint disease.

Patients and methods

From a total of 127 patients who presented with category 5 TMJ[2] end-stage joint disease over a 3-year period (May 2010 to May 2013), 85 met the inclusion criteria and 56 agreed to participate in this retrospective, comparative, cohort study (Fig. 1). The 56 patients were recruited on a first-come basis until each of the four study groups contained a maximum of 16 patients. The exception was the condylectomy group, as this is a rarely performed operation; only eight patients could be recruited during the time-frame of the study. The four study groups were a preoperative group ($n = 16$), condylectomy group ($n = 8$), rib graft group ($n = 16$), and prosthetic joint group ($n = 16$) (Table 2).

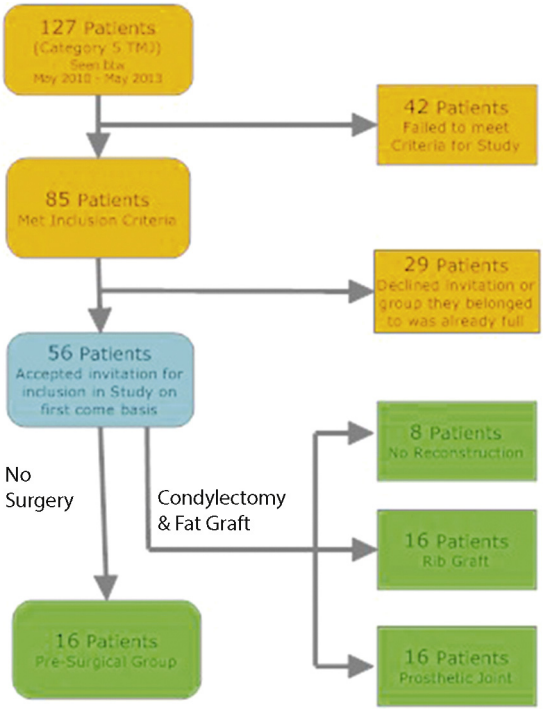

Fig. 1. Flow diagram showing the selection process for patient participation in the study.

The study was conducted according to the STROBE recommendations (http://www.strobe-statement.org/), which are endorsed by a growing number of biomedical journals. Data for the study were collected in a retrospective, cross-sectional manner so that each patient was interviewed and assessed only once during the course of the study. A maximum of 16 patients with full histories, clinical assessments, and completed questionnaires were obtained for each group (except the condylectomy group, which had only eight patients). Each group was matched for age and sex so that any additional males above two in each group (but one for the smaller condylectomy group) were not included. Further selection criteria for inclusion in this study were as follows: (1) adult patient >25 years old; (2) history of intolerable clinical symptoms of TMJ pain and dysfunction not relieved by lesser measures, such as medications, splint therapy, physiotherapy, or previous TMJ surgery, arthrocentesis, or arthroscopy; (3) radiological evidence (magnetic resonance and/or cone beam computed tomography scan) of category 5 TMJ – i.e., catastrophic changes to the joint resulting from osteoarthritis or a benign tumour (e.g., osteochondroma); (4) minimum postoperative follow-up of 12 months for all three treatment groups (Table 2).

All patients involved in this study were referred for surgical assessment and management from all around Australia. Furthermore, all surgical treatments were performed by the author. Patients in the treatment groups had already undergone their surgery and were being followed up when they were invited to participate in the study. Since the study was a retrospective look at surgical outcomes that did not interfere with the normal provision of surgical care, the project was found to comply with the principles of the National Statement on the Ethical Conduct of Human Research, as assessed by the human research ethics committee of the study hospital. Each patient provided signed consent to allow the de-identified data collected to be used in this study. The following patients were excluded from the study: (1) patients <25 years old; (2) surgical patients not treated by the author, i.e., cases done by registrars in training; (3) those with a known psychiatric history; (4) those with a systemic arthropathy, e.g., rheumatoid arthritis or other autoimmune or collagen disorders that affect joints; (5) those who could not understand the questionnaire, e.g., recent immigrants and the