ADVANTAGES AND DISADVANTAGES OF SEMICONSTRAINED AND UNCONSTRAINED TERA IN RHEUMATOID ELBOW

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INTRODUCTION

Rheumatoid arthritis of elbow is difficult to treat. In rheumatoid arthritis, the elbow is involved in 20~50% of cases. Surgical treatment of the patient with rheumatoid arthritis continues to evolve. Synovectomy continuous to be an effective palliative procedure, preferred in the early stages of disease(I,II, IIIA) with or without radial head resection. In more advanced stages (IIIA, IIIB,IV) total elbow replacement arthroplasty has been used. Although radial head excision with synovectomy may improve symptoms of the rheumatoid elbow in 69 % of the cases total elbow replacement arthroplasty(TERA) relieves pain more reliably than radial head excision with synovectomy in the medium term. The commonly used TERA are semiconstrained and unconstrained types. The author experienced Mark II semiconstrained type and two unconstrained types, i.e., Pritchard ERS and Kudo.

COMPONENT OF IMPLANTS

The Pritchard ERS has three components; humerus, ulna and radial head. There are two types of humeral component, resurfacing and stemmed type. In Kudo elbow the radial head is resected and only humerus and ulna are replaced with prosthesis. The humeral component is made of cobalt-chromium alloy and its stem is porous coated with a plasma spray of titanium alloy. There are two options for the ulnar component: all-polyethylene type and a metal backed type with a porous-coated stem. In this study metal backed type of the ulnar component was used.

In the Mark II prosthesis, the ulna and humeral components are linked together by an axle pin, giving maximal amount of internal stability, but allowing a mild amount of mediolalteral and rotational motion in addition to unrestricted flexion and extension.

Main difference between semiconstrained and unconstrained prosthesis lies on this. In unconstrained prosthesis, the component parts of the surface replacement prosthesis are not linked together and depend on ligaments and muscle to keep them aligned while function. Inadequate ligament balancing or inappropriate positiong of component parts can result in loss of desired alignment and painful joint subluxation or dislocation. However, the advantage of this implant over the hinge prosthesis is that less intrusion into the medullary canals of the distal humerus and proximal ulna is required for

fixation of the implant stem.

INDICATIONS

Because of its stability the semiconstrained hinge prosthesis is usually used when destruction of bony and soft tissue elbow support has occurred to the extent that a prostheis with internal stability is required. Under conditions of less advanced bone and soft tissue destruction, the surface replacement type of prosthesis generally is used.

Should a surface replacement implant fails because of late loosening, instability associated with dislocation or infection, revision surgery can be undertaken with a semiconstained hinge implant. However, the converse of this situation is not true.

In rheumatoid elbow we often encounter contractured soft tissue in the anterior aspect of the elbow joint. Shortening of the distal humerus at the time of surgery overcome the problem. Since shortening of the distal humerus sacrifices the function of the supporting medial and lateral collateral ligaments, unconstrained prosthesis may results in postoperative instability. The semiconstrained hinge prosthesis is more advantageous than the unconstrained type prosthesis in those cases.

The main drawback of the TERA is possibility of development of complication immediately or later on. For the experienced surgeon intraoperative complicatons such as neurovascular transection is not likely. There may be some difficulty in operation according to the types of the implants and there may be subluxation or dislocation developed by inappropriate treatment of the soft tissue. This could happen in cases of severe contracture. In the long run there may be wear, loosening and osteolysis.

As for resection of the radial head as in Kudo elbow there are controversies. In capitellocondylar elbow prosthesis the maximum valgus-varus laxity was consistently higher than that of intact elbow joints and muscle forces alone are insufficient to maintain the stability. Despite of this data and continuous reports of instability the choice of regarding excision of the radial head can be left to the discretion of the operating surgeon, because it is the matter of the quality of the bone stock, the integrity of the ligaments, the positioning of the implant, the reconstruction of the ligaments and the design of the prosthesis (for example , intrinsic constraint). Dislocation of the unconstrained prosthesis can occur although it is not so frequent. However, the articulating surface of the humeral component of the type 5 Kudo prosthesis has a shallow, wide monofacet configuration in the frontal plane, which allows for mediolateral shifting of the ulnar component on the articular surface of the humeral component without the risk of lateral subluxation.

In semiconstrained prosthesis complications involving the ulnar nerve, intraoperative fracture, triceps disruption, deep infection, and periprosthetic rediolucency are concern. This factors seem to be related to the technical difficulty because of long stems of both humerus and ulna.

MATERIALS AND RESULTS

In Korea, the unconstrained type prosthesis was introduced earlier than the semiconstrained type. There was no choice in that earlier pioneer days. I have tried Pritchard ERS in 3 cases of bony ankylosis and 2 cases of fibrous ankylosis. I also tried Kudo elbow in 1 case of bony and 2 cases of fibrous ankylosis.

Here I would like to evaluate the results of the three types of TERA.

Based on up to 16 years of follow-up of 54 total elbow replacement arthroplasty of rheumatoid elbows the advantages and disadvantages of semiconstrained Mark II(16), unconstrained Pritchard ERS(20) and Kudo(18) elbow were evaluated and compared each other in terms of technical standpoint, the functional results and the complications.

No case showed intraoperative complication in any types of implants. There was no immediate postoperative instability developed even in cases of bony or fibrous ankylosis. In Pritchard ERS, revision was necessary in 3 cases; one late developed subluxation of radial head and two osteolysis and loosening. In Kudo elbow, revision was performed in 2 cases; one osteolysis and loosening and one late developed dislocation of humeroular joint. There was no case of revision in Mark II yet although there was osteolysis on the X-ray. However, longer term follow-up study is necessary to draw conclusion for this type of TERA.

The main benefit of the semiconstrained type was 'no fear of dislocation' after operation even though there was some technical difficulty in case of severe contracture of the elbow joint. The main advantage of the unconstrained type was technical easiness on operation in case of contracture. However, there was a chance of delayed subluxation of radial head in Pritchard ERS. In Kudo elbow there may be exaggerated valgus deformity and the resultant instability in limited cases. There were 5 cases of exaggerated valgus with complaints of subtle instability and weakness. In Pritchard ERS, there was no difference between the resurfacing and the stemmed type, or cemented and uncemented type in terms of incidence of complication. Muscle power returned to functional level even in cases of bony or fibrous ankylosis. In all types osteolysis and wear of polyethylene lining, which developed with passage of time were the main concern.

In summary, it appears that when it is properly performed, total elbow arthroplasty with either semiconstrained or nonconstrained type of prosthesis yields satisfactory functional results although osteolysis, loosening and wear problem are remained to be solved.

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