Stemless humeral component in reverse shoulder prosthesis in patient with Parkinson’s disease: a case report

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Summary

Introduction. In patients with Parkinson’s disease falling is very common and for this reason, the prosthetic surgical indication in shoulder is reserved for special cases. PD has been linked to several interrelated factors that may contribute to failure of shoulder arthroplasty.

Case presentation. A 65-year-old woman with PD, severe pain, recurrent bursitis, swelling and functional limitation to all movements in left shoulder presented to our attention. Radiographic and CT exams show cuff-tear arthropathy. The patient was submitted to implantation of a Reverse Shoulder Comprehensive Nano cementless modular system (Biomet®, Warsaw, IN, USA) with anterosuperior surgical approach. We chose this kind of solution of stemless humeral component after bone mineral consideration.

Discussion. Reverse shoulder arthroplasty represents an option in the management of glenohumeral arthritis. Poor functional results of RTSA in patients with PD have been attributed to increased muscle tone, severity of tremor and an increased mortality rate. In general, post operative complications related to the humeral component are dominated by fractures (between 1 and 3%); in patients with PD this percentage is higher because of falls often occur. With a stemless implant revisions can be performed easily. Overall, the anterosuperior surgical exposure gives a low risk of postoperative instability.

Conclusion. In selected cases of patients with PD, after carefully analysis of bone quality, the use of a stemless component is of benefit in the possible revision cases for periprosthetic fractures and the use of an anterosuperior exposure reduces the percentage of instability. The results obtained about the pain relief are excellent in contrast with functional outcomes that remain poor.

KEY WORDS: reverse shoulder arthroplasty; stemless component; Parkinson’s disease.

Introduction

Parkinson’s disease (PD) is a motor system disorder and consists in the result of the loss of dopamine-producing neurons in the substantia nigra pars compacta. PD usually affects people over the age of 50. The primary symptoms of PD are tremor or trembling in hands, jaw, legs, arms and face; rigidity or stiffness of the limbs and trunk; bradykinesia or slowness of movement, postural instability or impaired balance and coordination. As these symptoms become more pronounced, patients may have difficulty walking, talking or completing simple tasks. As the disease progresses, the shaking or tremor, which affects the majority of PD patients may begin to interfere with daily activities. The upper extremity is more involved in tremor and choreiform movements than the lower extremity.

Falling can be attributed to the motor disturbances associated with PD and is very common in these patients. Falling did correlate with postural instability, bradykinesia and rigidity but not with tremor. Falling was also related to age and duration of disease. The frequency of falling was correlated only to the severity of one parkinsonian symptom, postural instability (1). Koller et al. reported that 38% of patients with PD report falls: 13% fell more than once per week (2).

For this reason, the prosthetic surgical indication in shoulder is reserved for special cases where there is a serious impairment of a limb, a major pain symptoms and deterioration in quality of life.

PD has been linked to several interrelated factors that may contribute to failure of shoulder arthroplasty. 17% of these patients sustained fall-related fractures and eventually periprosthetic fractures.

Case report

A 65-year-old Caucasian woman with PD in advanced stage diagnosed about 15 years earlier and severe shoulder pain presented to our attention. In 2009 the patient was subjected to surgery implant of DBS (Deep Brain Stimulation) with a net improvement in symptoms, in particular with decrease of tremors.

The patients underwent arthroscopic debridement, acromioplasty, bursectomy and biceps tenotomy of the long head of the biceps for management of an irreparable left rotator cuff in 2011. From 3 years ago she had recurrent bursitis at left shoulder, and within a year the patient underwent multiple arthrocentesis.

Clinically, she had swelling and diffused pain in left shoulder. There was functional limitation to all movements with abduction active permitted up to about 20 degrees and passive...
was to about 50 degrees. Constant score at the time of acceptance resulted 29.
The evaluation of the pain was made with visual analogue scale (VAS) and it was 8.
Pre-operative X-ray evaluation shows glenohumeral osteoarthrosis and reduction of sub-acromial space (Figure 1).
CT exam of the left shoulder showed marked degeneration of the scapulo-humeral joint with disappearance of the joint space, cranial subluxation of the humeral epiphysis and presence of geodes on both sides. There was also a marked distension of the subacromial-deltoid bursa compatible with chronic proliferative synovitis and invertebrate tear of the tendons of the rotator cuff (Figure 2).
The MR is not performable because of the patient has DBS implant.

The patient was investigated for osteoporosis: with the humeral cortical index (0.26) and the blood laboratory tests (calcium = 9.5 mg/dL; phosphorus = 3.4 m/dL) we excluded a context of bone fragility (3).
It was therefore decided to submit the patient to surgical implantation of a prosthesis reverse shoulder with anterosuperior surgical approach. Intraoperatively was found excellent consistency of the patient’s bone, and opted for planting Reverse Shoulder Comprehensive Nano cementless modular system (Biomet®, Warsaw, IN, USA).
Currently after a follow-up of 3 months the patient is performing intense active and passive physiotherapy and in Rx exam the prosthesis appears well positioned (Figure 3).
Actually the Constant score is 37 and VAS is 1. Although the patient reported pain reduction but postoperative active ROM remained significantly limited compared with what has been reported for patients without PD.

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Discussion

Reverse shoulder arthroplasty represents an option in the management of glenohumeral arthritis, proximal humeral fractures, revision after failure of previous total shoulder arthroplasty or hemiarthroplasty with concomitant or pre-existing rotator cuff deficiency.
In RTSA global one of the most common complication is instability (Zumstein et al. 5%; Gallo et al. 15%; Edwards et a. 6%) (4-7).
Kryzak et al. followed 43 TSA cases in patients with PD over a mean of 8 years: 47% had unsatisfactory results. In X-ray evaluation 20 shoulders demonstrated glenohumeral subluxation: 8 shoulders has superior subluxation, 2 severe posterior subluxation and 7 anterior subluxation. 8 of the 43 TSAs underwent revision surgery because of instability (8).
Koch et al. reported following 16 TSAs in patients with PD at mean follow-up of 5.3 years. Functional results were poor, but pain relief was significant. 10 of these 16 cases had a change in joint position, mainly superior subluxation and 3 patients required revision surgery (2 for symptomatic sub-luxation) (9). Dunn et al. reported 3 cases of RTSA in patients with PD: all the patients had pain reduction but postoperative active ROM remained poor.

Poor functional results have been attributed to increased muscle tone, severity of tremor and an increased mortality rate.

Functional results are worse in patients older than 65 years of age.

Falls, weak musculoskeletal structures, and onset of dementia further limit functional benefits in these patients.

In general, postoperative complications related to the humeral component are dominated by fractures (between 1 and 3%): they are more common than in earlier years and have a negative impact on the clinical outcome.

We calculated the humeral index and we measured the amount of calcium and phosphorous in blood for identify a context of osteoporosis; fractures of the proximal humerus are frequent and they are 20% of all osteoporotic fractures.

The cortical index is the ratio between the thickness of the cortical and the total diameter of the humeral diaphysis. Fracture risk limit value’s 0.231: the patient’s value was 0.26 and it may provide a simple way of determining the bone quality of the proximal humerus and it facilitated decision-making in the surgical choice (2, 10-13).

In patients with PD this percentage is higher because of falls often occur.

The overall complication rate has decreased as a result of changes in implant design. In contrast, the rate of periprothetic humeral fractures has increased (14).

In stemmed implants, a potential difficult problem is stem removal in case of revision surgery. A vertical osteotomy is intraoperative humeral fractures and the fixation of the new stem in the situation of important bone loss or fracture is difficult and often requires the use of a long massive stem and the use of cerclage wiring or cable plate system.

For all these factors we decided to perform an antero-superior surgical exposure to the shoulder for the implant of a stemless RTSA.

The anterosuperior approach preserves the subscapularis tendon and in general the anatomy of the shoulder. This kind of approach has lower rates than deltopectoral approach for problems (7.1 vs 9.8%), complications (18.7 vs 23.5%), reoperations (0.6 vs 3.6%) and revisions (5.8 vs 9.5%) (7).

Overall, the anterosuperior surgical exposure gives a low risk of postoperative instability (0.8% luxation vs 5% in deltopectoral approach in primary RSA and revision RSA).

The anterosuperior approach also permits a good frontal exposure of glenoid and axial humerus preparation.

Ample glenoid bone stock of quality is a prerequisite for RTSA implants and is also necessary good humeral bone stock for a stemless prosthesis (15, 16).

The advantages of stemless prosthetic implants are well known in orthopedic surgery: less invasive surgery, fewer intraoperative iatrogenic and postoperative problems, fewer stem complications and the possibility of easier revisions, especially in patients with PD.

This kind of implant was developed for post-traumatic indications and can often replace stemmed designs if the bone quality is good allowing a press-fit fixation and the surgical procedure is faster and allows the preservation of the bone stock from its initial cut, and the estimated blood loss is significantly lower than stemmed implants (17-19).

Stemless implant eventually permits, in case of fractures of humeral diaphysis or distal humerus to perform an internal fixation without revision surgery of prosthesis (20).

The comprehensive shoulder platform that includes the Comprehensive Nano humeral component (Biomet®, Warsaw, IN, USA) is fully convertible between hemi, anatomic and reverse components options. The primary press fit fixation for bony in-growth of the Comprehensive Nano humeral component (Biomet®, Warsaw, IN, USA) provided by PPS, Porous Plasma spray coating. This component eliminates violation of humeral canal and preserves the humeral bone stock (21).

In stemless implants the eventual revision surgery can be performed more easily and safely, reducing the risk of typical complications.

In conclusion, the prosthetic surgery in a patient with PD is a complicated choice because of both cognitive and motor factors.

It’s difficult to have a sufficient bone stock in patients with PD in surgery time, however, we believe that in selected cases the possibility of this type of component (stemless) is of benefit in the possible revision cases for periprosthetic fractures.

The use of an anterosuperior exposure at the shoulder for this type of system reduces the percentage of instability in these patients.

It is however evident that the results obtained about the pain relief are excellent in contrast with functional outcomes that remain poor compared to the normal population because of the peculiarities of the Parkinson’s disease.

Disclosure

The Authors declare no conflict of interest. No financial support was received for this study.

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

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