



Metacarpophalangeal Arthroplasty in Rheumatoid Hand: Our Experience of the Neuflex® Prostheses

Arnaldo Sousa^{1,2*}, Margarida Areias^{1,2}, João Rosa^{1,2}, Marta Santos-Silva^{1,2}, Alexandre Pereira^{1,2} and César Silva^{1,2}

¹Hand Unit, Department of Orthopaedics, Centro Hospitalar do Porto, Portugal

²Instituto de Ciências Biomédicas Abel Salazar, Universidade do Porto, Portugal

*Corresponding Author: Arnaldo Sousa, Department of Orthopaedics, Centro Hospitalar e Universitário do Porto, Porto, Portugal.

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Abstract

Background: The metacarpophalangeal joint (MCP) is the most important joint for the finger function. The rheumatoid destruction of these joints causes severe deformity and functional loss.

MCP arthroplasty in rheumatoid arthritis patients is aimed at restoring function, improving range of motion, decreasing pain, correcting deformity and improving the aesthetic appearance of the hand.

Objectives: The objective of this study was to evaluate the results of NeuFlex® MCP prostheses in patients with rheumatoid hands, done in an institution over a 12 year period.

Study Design and Methods: We evaluated 96 NeuFlex® MCP prostheses performed at our institution in rheumatoid arthritis patients between January 2007 and December 2018 and analyzed clinical and radiological results using scales and algorithms of pain, mobility, function and satisfaction.

Results: Of the 36 patients evaluated, the majority (28) were women and 14 were operated bilaterally. The average follow-up of these patients was 8.3 years. Pain was the main reason for surgery, followed by deformity and functional loss.

Pain relief was observed using the visual analogue scale, averaging 5.3 points and an improvement in the range of mobility of 26°. There were 9 complications that needed revision: 6 implant dislocations and 3 fractures.

Overall satisfaction was positive for all patients, with improved deformity and activities of daily and professional life.

Conclusion: Neuflex® MCP arthroplasty has been shown to be an effective treatment in rheumatoid patients, with excellent results in pain relief, aesthetic and functional improvement.

Keywords: Metacarpophalangeal Arthroplasty; Neuflex® Prostheses; Rheumatoid Hand

Introduction

It is estimated that rheumatoid arthritis (RA) affects 1% of men and 3% of women worldwide [1].

Metacarpophalangeal (MCP) joints are usually among the first joints affected in rheumatoid arthritis [2,3]. Because the disease

is systemic, both hands and all MCP joints are usually more or less involved. With the progression of disease, MCP joints become destroyed, subluxated, deviated and painful.

Nowadays the treatment of choice is arthroplasty. After trials of interposition arthroplasties, metallic and various plastic pro-

theses, silicone implants have become the golden standard for replacement of MCP joints [4].

These type of prostheses were introduced in 1968 by Swanson [5] and aim to restore mobility functional and stability, being able, in certain situations, prevent disease progression by developing of a stable fibrous capsule [1,6,7]. The Swanson implant underwent a redesign in 1986 using a new polymer³ and remains the most widely studied implant for MCP joint arthroplasty [7,8].

In 1998, the NeuFlex implant (DePuy Orthopaedics Inc., Warsaw, IN), surged with a volar angulation of 30° (the main difference to the original straight prosthesis of Swanson) to facilitate flexion, improve biomechanics and diminish peak stresses (Figure 1) [9].

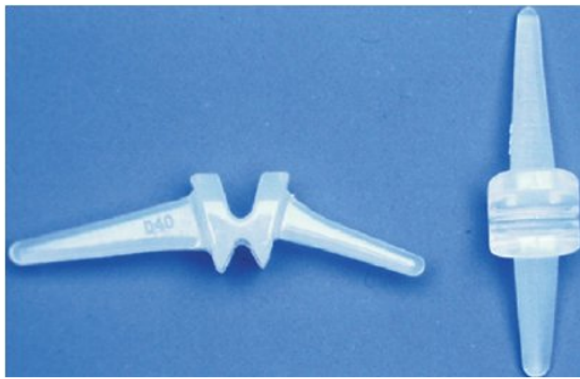


Figure 1: The anatomically neutral NeuFlex implant (MCP shown) has a 30° intrinsic bend at the MCP hinge.

Early clinical studies suggest that the range of MCP joint flexion after reconstruction of the rheumatoid hand with NeuFlex implants is satisfactory [10] may be better than Swanson implants for active MCP joint flexion [11] and is similar to that achieved with the Sutter implant [12].

Purpose of the Study

The purpose of this study was to assess the results of this NeuFlex MCP prosthesis, done in an institution over a 12 year period, with respect to pain, function, deformity, life activities daily and overall satisfaction of these patients.

Materials and Methods

This study was approved by the local ethics committee and was conducted in compliance with the standards of the Declaration of Helsinki.

A retrospective cohort study was made of all the rheumatoid patients submitted to MCP joint arthroplasty by the same experienced hand surgeon over a 12-year period (January of 2007 to December of 2018) in an institution, with the same NeuFlex prosthesis.

All patients were characterized in terms of age, gender, comorbidities and diagnosis that led to the arthroplasty.

The outcomes studied were clinical and radiographic.

We analysed pain, function and aesthetic appearance pre-operatively and at 1 year follow-up. For pain the Visual Analogue Scale (VAS) was used. For function the arc of mobility and Quick Dash Score was accessed. For the aesthetic appearance a satisfaction questionnaire was applied.

All the yearly follow-up radiographs were analysed and complications were evaluated.

Surgical procedure and post-operative care

A dorsal transversal incision was made when patients underwent MCP joint replacement of 3 or 4 MCP joints. A dorsal longitudinal incision was made when only 1 or 2 joints were replaced. The extensor hood and capsule were incised radially and longitudinally. Soft tissue realignment was made when needed, including ulnar collateral ligament release, crossed intrinsic transfer, and imbrication of the radial dorsal hood, as required to centralize the extensor tendons and realign the fingers at the MCP joint.

Rest splints were applied on the first postoperative day and a functional splint on the second or third day postoperatively. Physiotherapy continued for two months under the control of a physiotherapist.

Statistical analysis

Descriptive statistics were calculated. Chi-square, t-test and Mann-Whitney U-test, depending on the variable analyzed, were used to compare the population characteristics and the results pre

and post-operatively. Kaplan-Meier curves were used for the survival analysis.

Results

A total of 96 NeuFlex MCP prostheses were evaluated in 36 patients. There were a total of 50 hands with 14 patients being operated bilaterally. We exemplify a case at figure 2.



Figure 2: Comparison of rheumatoid hand with cubital and volar deviation of MCF joints and subluxation of extensor tendons (A) versus a post-surgical correction with prosthesis and soft tissue correction (B).

There were 28 women and 8 men, with a mean age of 59 ± 12 years (37 - 74).

The average follow-up of these patients was 8.3 years (range 2 - 14), with a minimum follow-up of 2 years.

Pain was the main reason for surgery, followed by deformity and functional loss.

Pain relief was observed in all cases, with an improve from a median pre-op VAS score of 6.9 to 1.6 post-operatively (p ≤ 0.001).

Radiographically, all prostheses showed good anatomical alignment at the scheduled 1 year follow-up with no significant early recurrent ulnar deviation (> 10°).

There was also significant improvement in the range of mobility with a 26° flexion/extension gain (p ≤ 0.001) comparing pre-operatively to 1-year follow-up.

The mean QuickDash score at final follow-up was on average 35 ± 17. Overall satisfaction was positive for all patients, with improved deformity and activities of daily and professional life.

The overall median survival of the prostheses, using Kaplan Meier curves with revision as end stage, was 111 ± 44 months. The 2-, 5- and 10- year survival rate were 97%, 93% and 87%, respectively (Figure 3).

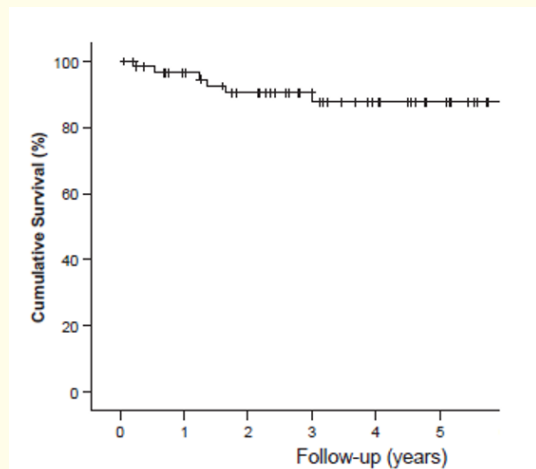


Figure 3: Kaplan-Meier survival curve with revision as the end point.

There were 9 complications requiring surgical revision: 6 implant dislocations and 3 implant fractures (Figure 4).

Discussion

With this study it became evident the overall improvement, after surgery, of the function of the MCP joints and the hands of these patients. NeuFlex® MCP arthroplasty has been shown to be an effective treatment in rheumatoid patients, with excellent results in pain relief, aesthetic and functional improvement.

The results of this study reveal that the NeuFlex implant has a low failure rate in the medium-term time frame with a survivorship of almost 87% at 10 years if revision is taken as the end point. This survivorship is comparable to Swanson and Sutter implants [11,13,14].



Figure 4: Fracture of the implant with dislocation of the index MCP joint.

The 10% revision rate observed in this study, with a mean follow-up of 8 years, is similar to previous reports [11,12,15,16].

There were 9 complications at our study requiring surgical revision: 6 implant dislocations and 3 implant fractures.

It is recognized that fracture of silicone MP implants is common [6,11,15,16]. Trail, *et al.* [16] reported that two-thirds of 1336 Swanson implants had fractured at 17 years follow-up. Goldfarb and Stern [6] reported that 67% of their Swanson implants and 52% of their Sutter implants had fractured at 14 years follow-up. A fractured implant does not necessarily mean a clinical failure, but recurrent symptoms are more likely with fractured implants [16]. Namdari, *et al.* [17] reported 1/29 fractures in their cohort of NeuFlex implants. Similar fracture rates between the NeuFlex and Swanson designs have been reported had also been reported

in other studies [15]. When NeuFlex and Sutter implants were compared in the MP joint, two out of 78 NeuFlex and five out of 78 Sutter implants broke [12]. Prosthesis dislocation was the most common complication requiring surgical revision at our study. This may be attributed to the functional deficit that condition comes with. Prosthesis fractures usually do not cause functional deficits so most of the times patients keep satisfied with the result and don't need surgical revision [16]. Our hypothesis is that a considerable number of prosthetic fractures are underdiagnosed, due to the reasonable clinical results and the low diagnostic accuracy of conventional radiographs.

Despite the limitations of observational studies like this one we still feel that overall there is a remarkable uniformity in the observed reported outcomes of other studies [10,15] suggesting the NeuFlex MCP arthroplasty to be an effective procedure in this patient population with mainly favorable results in terms of reduction in stiffness, pain, improvements in function and good satisfaction results. In our opinion, therefore this procedure should still be considered as a viable option in management of rheumatoid patients with intractable pain and progressive loss of hand function.

Conclusion

Neuflex® MCP arthroplasty has been shown to be an effective treatment in rheumatoid patients, with excellent results in pain relief, aesthetic and functional improvement.

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