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Original article

Comparison of proximal interphalangeal arthroplasty outcomes with Swanson implant performed by volar versus dorsal approach

Résultats des arthroplasties prothétiques interphalangiennes proximales de Swanson par voie palmaire versus voie dorsale

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ABSTRACT

No study has compared the QuickDASH score after Swanson implant arthroplasty performed by dorsal versus volar approaches. This study compared the outcomes of PIP arthroplasties through a volar approach as described by Schneider versus a dorsal approach as described by Chamay by determining the QuickDASH score, pain and range of motion. Our series included 21 Swanson implant arthroplasty cases in 17 patients aged 62 years on average, among which 12 were females. A volar approach was performed in 9 cases (group I) and a dorsal approach was performed in 12 cases (group II). The difference between the average QuickDASH score preoperatively and at the last follow-up was strong (group I: -16.584; group II: -1.444), the difference between the average pain level preoperatively and at the last follow up was very strong (group I: -2.098; group II: -4.506), the difference in average PIP extension was not different from 0 (group: I -5.805; group II: -11.332), the difference in average PIP flexion was very strong (group I: -2.716; group II: -2.007). There were four recurrences of swan neck deformity (3 in group, 1 in group II) and one implant fracture in each group. For Swanson implant arthroplasty, the volar approach leads to better QuickDASH scores and PIP flexion compared to the dorsal approach. The volar approach did not improve PIP extension, or pain, and did not lead to dysesthesia.

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RÉSUMÉ

Aucune étude n'a comparé le score QuickDASH des arthroplasties de Swanson par voie palmaire versus voie dorsale. Cette étude comparait les arthroplasties de Swanson opérées par voie palmaire de Schneider versus voie dorsale de Chamay selon le score QuickDASH, la douleur, la mobilité. Notre série comprenait 21 arthroplasties IPP Swanson chez 17 patients d'âge moyen 62 ans, dont 12 femmes. Une voie palmaire avait été réalisée dans 9 cas (groupe I), une voie dorsale dans 12 (groupe II). La différence entre le score QuickDASH moyen préopératoire et au dernier recul était forte (groupe I : -16,584 ; groupe II : -1,444), la différence entre la douleur moyenne était très forte (groupe I : -2,098 ; groupe II : -4,506), la différence entre l'extension moyenne de l'IPP pouvait être considérée comme non-différente de 0 (groupe I : -5,805 ; groupe II : -11,332), la différence entre flexion moyenne de l'IPP était très forte (groupe I : -2,716 ; groupe II : -2,007). On notait 4 récurrences de déformation en col de cygne (groupe I = 3, groupe II = 1) et 1 fractures d'implant dans chaque groupe. Nos résultats ont montré qu'avec une même arthroplastie IPP, la voie palmaire donnait de meilleurs résultats sur le score QuickDASH et la flexion que la voie dorsale. La voie palmaire n'a pas amélioré l'extension de l'IPP ni la douleur, et n'a pas entraîné de troubles sensitifs.

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1. Introduction

The surgical treatment of severe damage in the proximal interphalangeal joint (PIP) can use constrained [1], semi-constrained [2], or non-constrained [3] arthroplasty implants. They can be implanted using volar [4], dorsal [5,6], or lateral [7] surgical approaches. Several studies have compared the results of different implant arthroplasties [7–11]. Only one study has compared the pain and range of motion after PIP arthroplasty with a Swanson implant when a volar or dorsal approach is used [12]. No study has compared the outcomes in terms of the QuickDASH score.

The goal of this study was to compare the outcomes of PIP arthroplasty with a Swanson implant using Schneider's volar approach versus Chamay's dorsal approach in terms of the QuickDASH score, pain and range of motion. The main hypothesis was that the QuickDASH score after a Swanson implant arthroplasty will improve more when a volar approach is used than when a dorsal approach is used. Secondary hypotheses were that pain relief and range of motion will be greater when using a volar approach than a dorsal approach.

2. Material and methods

We reviewed the files of all patients who underwent PIP arthroplasty between 2008 and 2015 in our department. We excluded patients under 18 years, pregnant women, patients operated with non-constrained [3] or semi-constrained implants [2], patients who underwent emergency surgery, patients with less than 2 years' follow-up and arthroplasty cases performed using Fahmy's dorsal approach [6]. We included patients who had received a Swanson silicone implant using a modified volar approach or a dorsal approach. Our cohort included 21 PIP arthroplasty cases in 17 patients aged 62.67 years on average (range: 40–77 years), of which 12 were female and 5 were male (Tables 1 and 2). The cause was inflammatory rheumatism in

8 cases, primary osteoarthritis in 10 cases and posttraumatic osteoarthritis in 3 cases. The middle finger was the most frequently affected.

All patients were operated under regional anesthesia in outpatient surgery. A volar approach [4] was used in 9 cases for group I (Fig. 1A). A dorsal approach [5] was used in 12 cases for group II (Fig. 1B). After performing an osteotomy, the proximal and distal diaphyseal shafts were prepared using a specific jig. A trial implant was used to determine the size of the definitive implant offering the widest range of motion possible in the sagittal plane without compromising frontal plane stability (silicone PIP[®], SBI-Stryker[™], Morrisville, Pennsylvania, USA). Finger strapping was used for 15 days in group I and a straight PIP splint in group II for 3 weeks.

Outcomes assessment consisted in evaluating the following items at the preoperative and last follow-up visit: QuickDASH score ranging from 0 (no discomfort) to 100 (severe disability of the upper limb), numeric pain rating scale ranging from 0 (no pain) to 10 (worst imaginable pain), active range of motion in flexion and extension. Complications and revision surgeries were recorded.

The statistical analysis consisted in comparing the averages of four quantitative variables matched in two groups between the preoperative and last follow-up visit. The comparisons were performed using Bayesian analysis methods, with Markov Chain Monte Carlo simulation methods. The results, in the form of probabilities ranging from 0 to 1, are particularly useful for small samples. In this study, we calculated the probabilities of observing a difference or not, for each of the indicators, with the results presented in the form of a probability between 0 and 1. The conclusion is quantified with an estimated distribution for each studied coefficient. The probability of observing a 90% or more difference in the confidence intervals between the two groups was interpreted as a strong difference, over 95% a very strong difference and over 97.5% a strict difference. All analyses were performed using R software version 3.1.0 and JAGS.

Table 1
Characteristics of 9 Swanson implant PIP arthroplasty cases performed in 8 patients using a volar approach.

Patient (n)	Age (years)	Gender (M/F)	Dominance (R/L)	Operated side (R/L)	Finger (1–4)	Etiology
1	63	F	R	L	2	PTA
2	57	M	R	L	2	DC
3	65	F	R	L	2	PA
4	62	M	R	R	5	PTA
5	73	F	R	L	4	PA
6	75	F	R	R	3	RA
7	58	F	R	R	2	RA
8A	71	M	R	L	4	RA (swan neck deformity)
8B	71	M	R	L	5	RA (swan neck deformity)

M: male; F: female; R: right; L: left; PA: primary arthritis; PTA: post-traumatic arthritis; DC: destructive chondrocalcinosis; RA: rheumatoid arthritis.

Table 2
Characteristics of 12 Swanson implant PIP arthroplasty cases performed in 9 patients using a dorsal approach.

Patient (n)	Age (years)	Gender (M/F)	Dominance (R/L)	Operated side (R/L)	Finger (1–4)	Etiology
1A	75	M	R	L	4	PA
1B	75	M	R	L	5	PA
2	40	M	R	L	5	PTA
3	77	F	R	R	4	PA
4	46	F	R	L	2	IR
5	61	F	R	R	3	PA
6	51	F	R	R	3	IR
7A	54	F	R	L	2	PA
7B	54	F	R	L	3	PA
7C	54	F	R	L	4	PA
8	63	F	R	R	2	PA
9	71	M	R	L	4	RA (recurrence of swan neck deformity)

M: male; F: female; R: right; L: left; PA: primary arthritis; PTA: post-traumatic arthritis; IR: inflammatory rheumatism; RA: rheumatoid arthritis.

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