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Patient Satisfaction after Revision Hip Arthroplasty or Resection Hip Arthroplasty due to Periprosthetic Infection

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A B S T R A C T

In this retrospective study we have analysed 10-year period results of all type periprosthetic hip joint infection treatments at our Department. Data for 73 patients were analysed and functional status for 41 patients evaluated. A smaller proportion of patients (45%) with resection arthroplasty as the definitive solution were satisfied. These were mostly females with numerous comorbidities and lower functional demands. Much better results were achieved in 2-stage revision arthroplasty group. In conclusion whenever possible revision arthroplasty should be done because probability of re-infection is much lower than was previously believed, and the functional status of patients and their general life satisfaction is much higher.

***Key words**: arthroplasty, infection, Girdlestone, hip, periprosthetic, revision*

Introduction

Periprosthetic hip joint infection occurs in 1–2% of joint replacements, and is one of the leading causes of arthroplasty failure[1–3]. Treatment includes one or two-stage replacement arthroplasty followed by antibiotic therapy[4,5]. Resection arthroplasty was once a definitive solution for septic or aseptic hip endoprosthesis loosening treatment[6,7]. Today it is mainly used as the first step in two-step revision arthroplasty; which is associated with the highest success rates in treatment of periprosthetic hip infections[8]. Rarely, in immune-compromised, older patients with poor general health or with highly resistant strains infection, resection arthroplasty is used as definitive solution. Advantage of resection arthroplasty is in a lower risk of recurrent infection compared to other treatment methods[6,9]. But problems related to this kind of treatment are inferior functional results, with abductor weakness related limping, significant leg abbreviation, instability, walking difficulties that require more energy, increased stress on lumbar spine and other joints[9]. On the other hand, late revision arthroplasty carries certain risks, such as re-infection, abductor muscles weakness, hip joint dislocation, limping and limited function improvement[10].

In our department periprosthetic hip joint infection treatment includes antibiotic therapy with two-stage revision. Hip endoprosthesis removal is the first step in potential two-stage revision, but in cases where the treating surgeon or the patient decided against revision arthroplasty, resection arthroplasty was the final treatment. Such a decision is made when the infection is caused by highly resistant pathogens, in cases of positive control punctures, positive scintigraphy scan findings, and in patients who have very poor general health state with numerous comorbidities, where a new surgical procedure would represent additional and unnecessary risk.

The aim of our paper is to analyse 10-year period results of all type of treatments at our Department. Outcome and functional status of patients after revision hip arthroplasty and resection arthroplasty as definitive procedure was measured and analysed.

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Material and Methods

In this retrospective, by Hospital Ethical Review Committee approved study we have analysed data of patients treated for septic hip loosening during ten years period (between 2000 and 2009). In that time period, 78 patients were treated with resection arthroplasty as the first step in possible two-stage revision. Out of these, medical documentation for 5 patients was lost, while the documentation for 73 patients was available for analysis. In the meantime, ten patients died. We have analysed medical documentation of all 73 patients and additionally 41 of 63 patients were clinically examined at final follow up visits. Patients who were not included in the final clinical examination (N=22) were either lost for follow up or refused to participate. For these patients functional scores were all marked as poor results (Figure 1). All patients signed the Informed consent form prior to any study procedure. Analysed patients data were divided in two groups. The first group included patients with resection arthroplasty as the first step in two-step revision, and second group of patients were those with resection arthroplasty as final treatment.

The analysis of patient data included following: type and duration of symptoms before resection arthroplasty, the indications for surgical treatment, preoperative hip aspirations, the presence of the fistulas, preoperative and intraoperative cultures, laboratory and scintigraphy scan findings, presence of comorbidity and duration of antibiotic therapy. This was followed by analysis of functional status of 41 patients who agreed to participate.

Functional results of patients with revision arthroplasty were compared to results of patients with resection arthroplasty. The same independent examiner clinically examined patients. For functional assessment following questionnaires were used: Harris hip score (HHS)[11] a system filled out by the physician for rating hip function, and four questionnaires filled out by the patient measuring several functionalities and change in health status: Short Form Health Survey (SF 36)[12,13], Dartmouth Primary Care Cooperative Research Network (COOP) and the World Organization of National Colleges, Academies, and Academic Associations of General Practitioners/Family Physicians (WONCA) score (COOP/WONCA)[14], Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC)[15], Falls Efficacy Scale-International (FES-I)[16].

Results

The first group included 20 patients with hip revision arthroplasty after resection arthroplasty. Three patients died in the meantime, one due to prostate cancer, and two due to a heart disease. The average age was 62.45 years (range 45–77 years). There were 9 female and 11 male patients. The second group consisting of 53 patients for whom it was decided (for various reasons) to be treated only by resection arthroplasty as final treatment. Average age in this group was 65.32 years (range 35–87 years) and there were 20 male and 33 female. Almost all patients had associated comorbidities, most commonly hypertension, cardiomyopathy and diabetes, also gout, rheumatoid arthritis, ankylosing spondylitis. Seven patients died in the mean time. The remaining patients in this group were divided into two subgroups. One subgroup included 24 patients relatively satisfied with results of this kind of treatment. One of these patients had bilateral resection arthroplasty. Second subgroup included 22 patients who were dissatisfied with the resection arthroplasty; 4 of them underwent revision arthroplasty in other institutions, 4 live abroad, and 14 are very unhappy with the treatment results and did not want to participate in this study. All of them we marked as poor results.

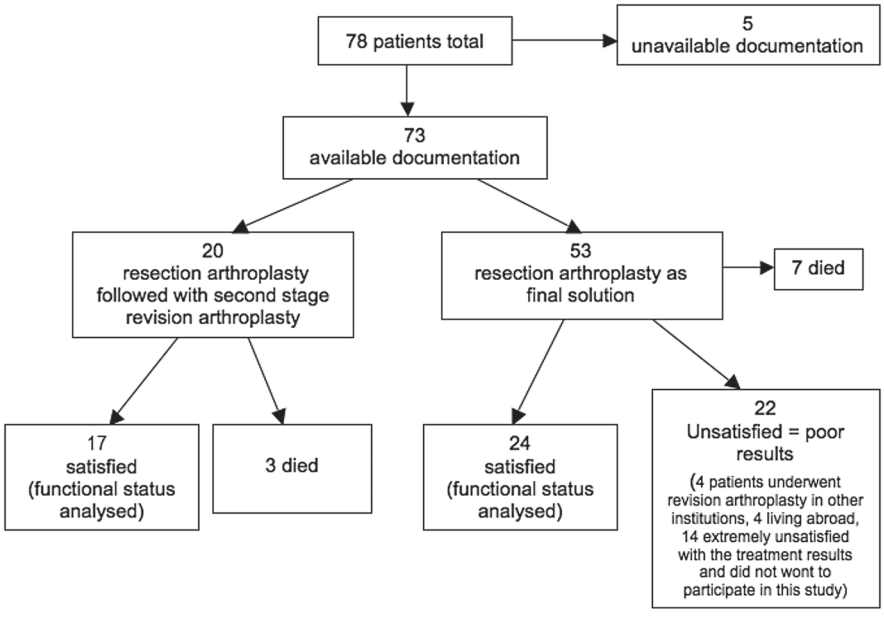

Fig. 1. Patient distribution.

Analysis of gathered data (Table 1) showed that time since primary hip arthroplasty to hip resection arthroplasty was on average 88 months, or 7.3 years (from 4 months to 29 years). Discomfort, primarily pain and limping, on average, lasted 25 months (1 month to 10 years) before resection arthroplasty was done. Some patients have had swelling and redness locally, and in 22 cases fistulas were present. In most patients, we found increased levels of inflammatory parameters (erythrocyte sedimentation rate – ESR and C-reactive protein). The average value of the erythrocyte sedimentation rate was 49.96 (5 to 145) and C-reactive protein 44.95 (4 to

TABLE 1
COMPARISON OF MEDICAL DOCUMENTATION DATA AND FUNCTIONAL RESULTS AFTER RESECTION ARTHROPLASTY AND HIP REVISION ARTHROPLASTY

	Revision arthroplasty	Resection arthroplasty as definitive solution	p
Medical documentation data comparition			
Average age/years±SD (min-max)	62.45±9.17 (41–77)	66.58±10.25 (35–88)	p=0.12
Male	11 (20)	20 (53)	p=0.18
Female	9 (20)	33 (53)	
Positive Technetium scintigraphy	16/20	31/53	p=0.087
Positive Gallium Scintigraphy	13/20	30/53	p=0.52
Average ESR±SD (min-max)	43.65±22.66 (2–85)	57.36±33.25 (5–140)	p=0.094
Average CRP±SD (min-max)	37.75±34.48 (3–145)	54.76±61.48 (4–353)	p=0.29
Positive preoperative culture	4 (20)	21/53	p=0.115
Positive intraoperative culture	12 (20)	41/53	p=0.138
Antibiotic therapy duration±SD (min-max)	39.25	47.54	p=0.36
Average time from endoprothesis extraction to rearthroplasty±SD (min-max)	14.05±7.45 (3–36)	–	
Luxation after rearthroplasty	3 (20)	–	
Reinfection after rearthroplasty	0		
Average range of motion			
Average flexion±SD (min-max)	86.82°±9.55° (70°–100°)	84.8°±13.88° (50°–100°)	p=0.66
Average extension±SD (min-max)	–0.91°±3.02° (–10°–0°)	0°±0°	p=0.13
Average abduction±SD (min-max)	32.27°±6.46° (25°–45°)	35.6°±9.35° (25°–50°)	p=0.29
Average adduction±SD (min-max)	20.91°±8.01° (10°–30°)	22°±10.10° (10°–40°)	p=0.75
Average internal rotation±SD (min-max)	6.82°±4.05° (0°–10°)	17.60°±10.42° (0°–40°)	*p=0.002
Average external rotation±SD (min-max)	18.18°±11.68° (5°–40°)	26.20°±10.03° (10°–45°)	*p=0.043
Positive Trendelenburg sign	9 (17)	23 (24)	*p=0.001
Average leg abbreviation/cm±SD (min-max)	1.64±0.83 (0–3)	5.52±2.77 (0–11)	*p=0.00007
Walking aid using			
no aid	10 (17)	0 (24)	*p=0.000001
one cruch	5 (17)	7 (24)	
two cruches	2 (17)	13 (24)	
walker	0 (17)	4 (24)	
Scores			
VAS	1.4	2.80	p=0.168
COOP WONCA	19.20	22.4	p=0.13
SF 36 PCS	36.5	27.7	*p=0.024
SF 36 MCS	48.5	45.5	p=0.8
SES	16.90	27.0	*p=0.0067
HARRIS HIP	77.4	52.2	*p=0.00001
WOMAC	26.0	47.2	*p=0.012

*p>0.001, **p>0.05, ESR – erythrocyte sedimentation rate, CRP – C-reactive protein, VAS – visual analogue scale, COOP/WONCA Dartmouth Primary Care Cooperative Research Network and the World Organization of National Colleges, Academies, and Academic Associations of General Practitioners/Family Physicians score, SF 36 – Short Form 36, PSC – Physical Component Summary, MSC – Mental Component Summary, WOMAC – Western Ontario and McMaster Universities Osteoarthritis Index

TABLE 2
INTRAOPERATIVE CULTURE FINDINGS AND ANTIBIOTICS THERAPY DURATION

Intraoperative culture	Resection arthroplasty as final solution	Revision arthroplasty	Average antibiotic therapy duration / days
Sterile	11 (53)	8 (20)	20.68
Streptococcus epidermidis	12 (53)	4 (20)	45.45
Staphylococcus aureus	5 (53)	2 (20)	55.75
MRSA	7 (53)	0 (20)	52.50
Coagulase negative Staphylococcus	6 (53)	2 (20)	46.28
Pseudomonas aeruginosa	1 (53)	1 (20)	52.50
Enterococcus faecalis	0 (53)	1 (20)	70
Acinetobacter spp	1 (53)	0 (20)	45
Salmonella	1 (53)	0 (20)	30
Corynebacterium spp	1 (53)	0 (20)	90
Mixed infection	7 (53)	2 (20)	76

353). Also, suspicion of infection was confirmed with positive scintigraphy findings with technetium, gallium or both. Most common intraoperativelly isolated pathogens were: Staphylococcus epidermidis, Staphylococcus aureus and Coagulase negative Staphylococcus (Table 2). All patients underwent antibiotic therapy after surgical treatment according to the antibiogram with average duration of 43.39 days (10–300 days). Average time from Girdlestone procedure to revision arthroplasty as second stage was 14.05 months (from 3 months to 3 years). After revision arthroplasty there were no re-infections. In one case re-acetabuloplasty was subsequently performed because of aseptic instability. Three patients had one dislocation after revision arthroplasty, and one of them needed an open reduction. Amount of pain did not differ between groups on final examination. Patients in both groups had similar postoperative range of motion except for internal and external hip rotation which was significantly better in resection arthroplasty group. Walking aids were significantly less used in revision arthroplasty group ($p<0.001$) and less fear of fall was recorded with FES questionnaire ($p=0.0067$). Patients in revision arthroplasty had higher score of physical component of SF 36 ($p=0.024$), while mental SF36 and COOP WONCA evaluation showed no differences between groups. Hip specific questionnaires showed significantly better results for patients in revision arthroplasty group both for HHS ($p<0.001$) and WOMAC score ($p=0.12$, Table 1).

Discussion and Conclusion

Treatment of prosthetic hip joint infections involves surgery and antibiotic therapy[4]. The type of surgery and antibiotic therapy depends on the timeframe of infection, type of microorganism and other individual patient's circumstances. At our department we perform two-stage revision arthroplasty whenever possible. We usually implant cementless total hip endoprosthesis with mandatory antibiotic prophylaxis, which is continued until final results of intraoperative cultures arrive. Then the therapy is discontinued if the cultures are negative or continued if the cultures are positive. Some authors suggested that 12 months is the optimal interval between endoprosthesis removal and revision arthroplasty, however it remains unclear on what basis this conclusion was made[17]. In our study interval between endoprosthesis removal and revision arthroplasty was on average 14.05 months (from 3 months to 3 years). In cases with longer time interval it was mostly due to fear of re-infection, which is often mentioned in the literature[11]. Lange et al.[18] analysed 36 studies that included patients with an infection of a total hip endoprothesis treated with either one-stage or two-stage revision arthroplasty and found out that reinfection occurred with an estimated absolute risk of 13.1% in the one-stage revision and 10.4% in the two-stage revision. In our study we had no re-infections after revision arthroplasty. Revision arthroplasty after resection arthroplasty is a complex procedure, but it can offer increase in function and decrease of pain for these patients. There was a significant increase in stability, a significant decrease in leg length difference (which in our patients decreased from an average of 6.8 cm to 1.6 cm) without any neurological disturbances (Table 1). Patients for whom revision arthroplasty was done, were satisfied with the result of treatment, had no significant problems and functional results were satisfactory. There was decreased fear of falling, however four patients used one or two crutches, not because they really need them, but because of sense of greater stability. In cases of poor general condition, many comorbidities and positive control laboratory findings we decided against revision arthroplasty but for resection arthroplasty as a final treatment. Oheim et al.[19], state that resection arthroplasty is still essential surgical strategy for treating hip joint empyema in cases in which functional outcome is of minor priority. Many authors agree that resection arthroplasty is a successful method of eradication of infection[17,20–22]. There are data confirming that 97.7% patients with resection arthroplasty are free of infection[23]. But most authors agree that these patients have poor functional status[21,24]. Similar findings were shown in our results in

patients with resection arthroplasty as definitive solution. Patients have good range of hip motion, with a significant reduction in pain, but there is increased sense of instability with a positive Trendelenburg sign. Also, leg length discrepancy of on average 6 cm (range from 3 to 11 cm) is troublesome. More than half of the patients in this group (14 patients; 58%) wear orthopaedic shoes with a corresponding rise of the heel, and all are permanently dependent on some kind of orthopaedic aids to help them walking, mostly in the form of two forearm crutches, walkers, or rarely one crutch. A smaller proportion of patients (24 patients; 45%) with resection arthroplasty as the final treatment were satisfied with this method of treatment[7] primarily because of the fact that the infection was cured. These are mostly frail females, with numerous comorbidities and low functional demands. They have a significant reduction in pain with a relatively satisfactory function, but because of fear of re-infection, they would hardly decide for revision arthroplasty. Twenty-two patients (42%) were extremely unhappy with the results of resection arthroplasty and did not want to participate in the study. Although we could not analyse their functional status but by phone interview, we found out that their dissatisfaction was primarily due to sense of instability in operated hip, significant leg abbreviation and the need for mandatory use of at least one crutch, resulting with significant influence on daily activities.

In conclusion we think that resection arthroplasty is still a viable option to save irretrievably failed hips in medically compromised patients. Limb shortening and inevitable need for walking aids should be clearly explained to patients during the consenting process in order to avoid unrealistic expectations. We believe that whenever the general health status of the patient and the successful eradication of pathogens allow it, revision arthroplasty should be done. With a well-preformed surgical treatment, adequate and long enough antibiotic therapy and appropriate antibiotic prophylaxis during revision arthroplasty, the probability of reinfection is much lower than was previously believed, and the functional status of patients and their general life satisfaction is higher.

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ZADOVOLJSTVO BOLESNIKA NAKON REARTROPLASTIKE TE RESEKCIJSKE ARTROPLASTIKE U LIJEČENJU PERIPROTETIČKE INFEKCIJE KUKA

SAŽETAK

U ovoj retrospektivnoj studiji su analizirani rezultati liječenja periprotetičke infekcije kuka u vremenskom periodu od deset godina. Analizirani su podaci iz medicinske literature 73 bolesnika, a u 41 bolesnika učinjena je i analiza

funkcionalnog statusa. Manji broj bolesnika s resekcijskom artroplastikom kao definitivnim rješenjem je zadovoljan rezultatima liječenja. To su uglavnom žene starije životne dobi s brojnim komorbiditetima i nižim funkcionalnim zahtjevima. Mnogo bolji rezultati su dobiveni u skupini bolesnika kojima je naknadno učinjena revizijska artroplastika kuka. Temeljem dobivenih rezultata zaključujemo kako bi kada god je to moguće trebalo učiniti revizijsku artroplastiku kuka, jer je vjerojatnost reinfekcije značajno manja nego što se ranije mislilo, a funkcionalni status bolesnika i njihovo opće zadovoljstvo životom puno veće.