REVISION TOTAL HIP ARTHROPLASTY

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ABSTRACT

Introduction: In revision total hip surgery the surgeon can encounter problems much more difficult and the results definitely not as satisfactory as after a primary total hip arthroplasty(1). The main reason for failure is loss of bone stock, which leads to mechanical problems and instability, also, dislocation, deep sepsis and fracture of the femoral shaft(2). The aim of this study is to evaluate and analyse the causes of failure of total hip arthroplasty which require revision surgery and the proper planning for the revision procedure.

Material and Methods:We reviewed a combined prospective and retrospective 20 patients who underwent revision hip arthroplasty in El-Sahel teaching hospital,during the period between Januray, 2008 and December 2012.The average age of the patients was54 years. There were 12 males and 8 females. . In this study the Harris hip score was used for clinical evaluation of the patients both preoperatively and postoperatively which had a score for pain, function, absence of deformity and range of motion out of a hundred point().Also,radiographic analyses was performed when follow up was made at 6 weeks, 12 weeks, 6 months, 1 yearand2 years.

Results: Because of variation in general health, and tolerance for discomfort, the clinical picture and radiographic findings did not always coincide.

The mean pre-revision harris hip score (3) was 34.18 points [minimum 1 point, maximum 69 points, SD 17.17], while, the mean hip score initial post revision was 80.82 points [minimum 43.00 points, maximum 97.00 points, SD 12.16]. The mean score difference was 46.64 points. The final overall evaluation results were (66%) of patients had excellent or good clinical results and (34%) of patients had either fair or poor clinical results. (MEAN , ± SD)

Conclusion: The revision total hip arthroplasty is a complicated operation, expensive to perform, and does not give results as good as a primary joint replacement. Of all causes of failure of total hip arthroplasty perhaps careful evaluation and selection of each patients, definite indication and careful proper surgical technique are the most important aspects in preventing failure.

Key wards: Revision, Total hip, Arthroplasty,Instability, Fracture.

INTRODUCTION

The success of primary total hip arthroplasty is well-documented in the literature with survival rates over 90% at 15-year followup (4). Unfortunately, some are not successful and have eventual revision. In addition, the cost and resource utilization of revision procedures are substantially higher than those of primary procedures. Many patients have unrealistic expectations regarding the longevity of their revision procedure (5-6). The current body of literature on revision total hip arthroplasty focuses mainly on the success of certain types of implants (7) , treating specific defects (8) , or evaluating specific techniques (9). Survival rates in the literature on revision total hip arthroplasty range from 35% at 10 years for cemented revisions to 100% at 10 years for femoral revision with impaction grafting (10). Most of the literature on revision THA focuses on specific techniques or implants, rather than outcomes from a variety of approaches and it is unclear whether specific data applies generally.

When planning a revision arthroplasty, these are several key questions that should be addressed. What are the causes of failure of previous THA. Which exposure should be used? How can the implant be removed? What type of reconstruction should be used and which implant should be chosen? How can stable fixation be achieved? (11).

PATIENTS AND METHODS

This study presenting a combined prospective and retrospective study of 20 patients who underwent revision hip arthroplasty – that is exchange or removal of one or both components as the end point for failure of primary total hip replacement. All cases were done in El-Sahel teaching hospital, during the period between Januray, 2008 and December 2012. With a mean age of 53.8 years (Range between 22-73 with SD 12.40). There were 12 males representing 60% of the patients and 8 females representing 40% of the patients. The mean interval between primary and revision hip replacement was 64.9 months (range between 12 – 168). The right hip revised in 14 patients (70%) while, the left hip were revised in 6 patients (30%). In primary total hip replacement the posterior exposure was used in 15 patients(75%) and the lateral exposure in 5 cases (25%).but the posterior exposure was used in revision of all the 20 patients (100%). Revision was done for 16 patients with cemented implants (80%) and 4 patients with cementless implants(20%). 15 patients (75%) had their primary hip replacement for treatment of osteoarthritis, three patients (15%)inflammatory etiology(two patients for rheumatoid arthritis(10%),one patient (5%) for systemic

lupus erythromatosis).The 3 cases were on long term systemic corticosteroid. Two patients (10%) were done for failed internal fixation of fracture neck femur. The indications for revision surgery were based on the clinical and radiological picture and intraoperative culture swabs taken from the hip joint for the patient. In this study therteen patients had their revision for aseptic loosening,with 3 cups loose and easily removed also , 3 stems loose (2 mobile and easily removed with presence of blackish fibrous tissue membrane between the bone component interface,and 1 stems was not loose in spite of having significant osteolysis around it radiologically) and 7cases both components are loose. Also we found three patients had their revision for dislocation of cups. Also we found 1cup was retroverted, 1 cup vertical, 1 cup **horizontal and** one patient had excessive stem anteversion, so, the malalignment of the components is a predisposing cause for dislocations,therefore, acetabular orientation is a vitally important aspect of the revision surgical technique. Also we found three patients had their revision for deep infection, 2 patients with primary diagnosis of rheumatoid arthritis, and 1 patient after congenital dysplasia of the hip where extensive dissection and stripping of the soft tissue and the three cases need bone graft which may also contribute to infection . One patient had his revision for periprothetic fracture distal to the tip of femoral component.

. To assess the hip the Harris hip score (3) was used for clinical evaluation of the patients both preoperatively and postoperatively which had a score for pain, function, absence of deformity and range of motion out of a hundred points (12).Rating 90-100 was considered as excellent, 80-89 as good, 70-79 as fair, and below 70 as failure. All the 20 patients were rated preoperatively below 70. Preoperative radiological evaluation show malposition of the cup(one retroverted,one horizontal,and onevertical) **and** one patient had excessive stem anteversion,also three cups dislocated.Areas of radiolucency around the acetabulum in 10 cases,and areas of radiolucency around the femoral component in 10 cases.One periprothetic fracture occurred between the rigid segment(stem and cement) and the flexable segment(distal to tip of femoral component) in obese 105Kg 1,7 M lengh osteoporotic patient.Subsidence of femral component in relation to lesser trochanter and migration of the cup in relation to tea drop of bohler in three cases suffering from deep infection. The femoral head allograft was supplied from the center of preservation and transplantation of musculoskeletal tissue (Bone bank) in Cairo university hospitals as a frozen graft.

SURGICAL TECHNIQUE

Spinal or general anaethesia according to patient condition.-

-Lateral position on orthopaedic table.

-Posterior approach, 15 cm long incision, centered on the middle of greater trochanter and parallel to the shaft of femur and along the fibers of gluteus maximus separating them manually and partial release of gluteus maximus insertion exposing the lateral rotators reflecting them medially to protect siatic nerve.Remove pseudocapsule and all periacetabular scar tissue is excised using diathermy knife and the acetabular rim should be clearly defined. This is important for safe removal of the old socket as well as introduction of morselised bone graft if needed and new socket. I**n Two stage exchange arthroplasty** , Removal of the infected femoral and acetabular components, debridement of inflammed and necrotic tissues, cerclage wires, cement, profusely irrigate with saline, then dry the feild and Insertion of the spacer impregnated with antibiotic like vancomycen and leave it for 6-8 weeks till clinical and laboratory data of the patient are in safe side to do the revision procedure. The use of acetabular rings or cages for reinforcement was carried out in addition to the grafting of the acetabulum with tightly packed morsellised cancellous bone graft taken from iliac crest in sex patients and from bone bank in two patients then trial cup to match the shape of the **acetabulum and** check for size and position then start preparing for cementation of the original cup. While the femur in flexion, adduction and internal rotation, rasp the femoral medullary cavity until reaching the proper size Then medium sized head is pushed on to trial neck and trial of reduction is undertaken to assess component position, leg length and joint stability in all direction and telescoping motion.. In four cases we need to reconstruct the trochanteric area of femur and in three cases the proximal femoral shaft through using morsellized bone graft then we use long stem cementless prosthesis or distally interlocking stem (Kent prosthesis). Then we remove the trial rasp, neck, and head,and insert the original femoral stem with antibiotic ladded cement. **. Closure of the wound in layers with insertion of suction drain. Carefull transfer of the patient from operating room to** his/her bed **with two pillows** between patient thighs to prevents adduction of the hip, and was kept for 2 weeks.

RESULTS

Indications for revision

Table (1): Indications for revision

Diagnosis	No. of patients	Percentage
Aseptic loosening	13	65
Dislocation	3	15
Infection	3	15
Fracture femur	1	5
Total	**20**	**100**

This table shows the different indications for revision hip arthroplasty. It was found that highest indication among studied group of patients wasaseptic loosening (65%) and the lowest was the fracture femur (5%).

Table (2): Revised component

Revised components	No. of patients	Percentage
Cup	3	15
Stem	3	15
Both components	14	70
Total	**20**	**100**

This table shows that the cup was revised in 17 patients of the studied group while the stem was revised in 17 patients of the studied group of patients.

Table (3): Correlation between the indication of primary total hip arthroplasty and revision

Revision 1ry diagnosis	No of patients	Loosening	Dislocation	Infection	# femur
POA	**3**	**2**	**1**	**-**	**-**
SOA	**9**	**7**	**2**	**-**	**-**
RA	**2**	**-**	**-**	**2**	**-**
AN	**2**	**2**	**-**	**-**	**-**
DDH	**1**	**-**	**-**	**1**	**-**
# neck femur	**2**	**1**	**-**	**-**	**1**
SLE	**1**	**1**	**-**	**-**	**-**
	20	**13**	**3**	**3**	**1**

P value was 0.0122 ($p < 0.05$).

This table shows that statistical analysis of the distribution of different modes of failure regarding the primary diagnosis using ANOVA test was significant.

The mean pre-revision hip score was 34.18 points [minimum 1 point,maximum69 points, SD 17.17], while, the mean hip score initial post revision was 80.82 points [minimum 45.00 points, maximum 97.00 points, SD 12.16]. The mean score difference was 46.64 points. Harris hip score (Table 4)

	Pre-revision	Initial post revision
Minimum	1	45
Maximum	69	97
Mean	34.18	80.82
SD	17.17	12.16

Difference of means = 46.64
T = 15.67

P value0.0087 statistically significant

Initial post revision clinical results. (Table 5)

Clinical results	No. of patients	%
Excellent	**5**	**25**
Good	**8**	**40**
Fair	**4**	**20**
Poor	**3**	**15**
Total	20	100

This table shows that five patients (25%) had excellent result, 8 patients (40%) had good result, 4 patients (20%) had fair result and 3patients (15%) had poor result.

DISCUSSION

The majority of elderly patients who receive a hip replacement retain the prosthesis for 15 to 20 years, and sometimes for life. However, some patients may need one or more revisions of a hip replacement, particularly if the initial hip replacement surgery is performed at a young age and the patient chooses to have a very active physical lifestyle. The most frequent reasons for revision are: repetitive dislocation of a hip replacement, mechanical failure (implant wear and tear – loosening – breakage**),** infection**,** periprothetic fractures. (13).So, we must think about the survival probability of revision hip surgery and what are the most common reasons for the failure of primary THR (14) . The aim of this study is to evaluate and analyze the causes of failure of total hip replacement which require revision. The number of patients in this work is not a high one and we could not standardized the parameter of evaluation in this group of patients as the indications for revision were variable with small number of patients of each. Also, the surgical technique and the used prosthesis are variable and this would affect the results, still the results obtained in it may point to a broad parameters concerning the failed primary total hip arthroplasty.

Our data and that in the literature suggest aseptic loosening and instability continue to be the primary modes of failure for both **primary** total hip arthroplasty. (Table 6) Literature review of revision total hip survivorship

Author	**Year**	**Number of patients**	**Followup**	**Type of revision**	**Survivorship of revision THA**	**Most common modes of failure**
Gramkow et al(15).	2001	84	11.4 years	Cemented femoral revisions	77.9% @ 10 years	Aseptic loosening
Engh et al(16).	2002	34	13.3 years	Fully porous stems for severe bone loss	89% @ 10 years	Aseptic loosening
Kwong et a(17)l.	2003	143	40 months	Modular cementless femoral component revisions	97.2% @ 5 years	Infection
Haydon et al(18).	2004	129	min 5 years	Cemented femoral revisions	71% @ 10 years	Aseptic loosening
Della Valle(19)	2005	138	15 years	Cementlessacetabular revisions	81% @ 15 years	Instability
Schreurs et al.(10)	2006	33	10.4 years	Femoral revision with impaction grafting	100% @ 10 years	No failures
McCarthy & Lee (20).	2007	62	14 years	Modular cementless femoral component revisions	60% @ 14 years	Aseptic loosening
Springer et al(12).	2009	1036	min 2 years	All revisions	82% @ 10 years	Instability and aseptic loosening

In this study, 65% of patients had their revision for aseptic loosening. It was found that 85% of patients had their revision for cup loosening and femoral stem loosening represent 85%. Regardless of the type of prosthesis (cemented component or cementless), the initial integrity of fixation to the bone depends primarily on its mechanical interlock (micro and macro) with osseous tissue (cancellous and cortical).

In this study, 15% of patients had their revision for dislocation .Acetabular orientation is probably the most difficult to assess accurately during the surgical technique. The unnoticed forward rotation of the pelvis in the lateral decubitus position is one cause of the malalignment of the component that can result in an unnoticed retroversion positioning of the cup or extensive femoral anteversion **(20)**. **All dislocations were posterior. In this study15% of patients had thei**r revision for deep infection . In surgical treatment of deep infection the two stage revision strategy was done. The average time to reimplantation of a new prosthesis in this study was 42 days (range, 4 weeks to 12 months), one patient needs multiple debridments to control the infection.

In this study 5% of patients had their revision for fracture femur at the junction between the flexible segment, that is distal to the tip of the stem, and the rigid segment, that is the stem and cement as a result of a traumatic event but more often are the result of minor trauma. The fractures was treated using a long stem cementless prosthesis with cerclage wire fixation or distal interlock fixation.

The mean age of the patients in this study were 53.8 years at the time of revision . The mean age at primary hip replacement was 36 years . Mean age of patients at revision for aseptic loosenings were 56.22 year for dislocation were 53.88, for infection were 44.5 years, and the age at time of fracture femur was 45years.

In this study,the majority of patients were males (12 males 60% and 8 females40%).

The rates of complication after primary total hip arthroplasty is higher in patients who have systemic disease or previously had failed internal fixation of fracture femur or acetabulum.

The mean time between the primary and the revision operation in this study was 64.9 months (range 12 to 168 months). It was found that the failure was early in cases of infection and dislocation and the survival of prosthesis was longer in cases of aseptic loosening.

- In aseptic loosening was 84 months.
- In dislocation was 30 months.
- In infection was 24.8 months.
- In fracture femur was 64 months.

The mean gain of hip score for the 20 patients with initial postoperative period was 40.04 points (the mean hip score improved from 34.18 points to 80.82 points).

In this study it was found that 65% of the patients with either good (40%) or excellent results (25%) initial postoperative.

The clinical results will be affected by time. This observation of (21) who concluded that the short term results after uncomplicated revision is comparable to the results of primary hip replacement, but with the passage of time the results tend to deteriorate.

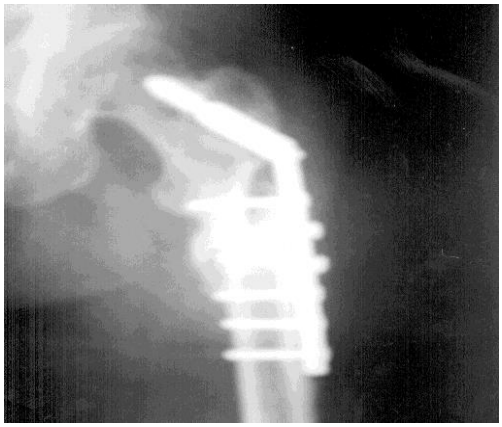
CONCLUSIONS

The four major causes of failure in total hip arthroplasty are, aseptic loosening of one or both components which is the most common mechanism of failure, dislocation of the joint, infection which has multiple causes, periprosthetic fracture. Infection complicating total hip arthroplasty is the most serious complication and prevention remains the best treatment. Malpositioning of the acetabular component is the most common cause for dislocation. Fracture of the femur in patients with a hip arthroplasty is a severe complication often comprises the result of the arthroplasty and present the most challenging problems in management. When dealing with revision surgery,

each case must be studied individually because selection of a specific revision technique depends on many factors, the reason for failure, the remaining bone stock, age and the functional demands of the patient.

CASES PRESENTATION

Case No. 1



Pre-op.A-P view Post revision by kentprothesis

6 3years old male patient with failed primaryTHR replacement for failed DHS for subtrochanteric fracture femur, two years later he had revision for deep infection. Two stage revision with interval between 6 months By kent prosthesis. Pre-revision hip score36Points Initial post-operative hip score was 73 Points.

CaseNo.2

Preoperative A.P. View.Postoperative A.P. View.

59 years old male patient had primary total hip replacement for primary osteoarthritis, he had 9 years later revision of both components due to fracture femur- Pre-revision Harris hip score 28 points. Initial post revision hip score 90 points.

Case No.3

Preoperative A-Pview Preoperative Lat viewPostoperativeA-Pview

acetabular component dislocation Harris hip score was 36 points
rheumatoid 36years old male patient one and half year later he had revision. Morselizedcancellous bone allograft was used with metal ring harriship92points.

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