International Journal of Orthopaedics Sciences

ISSN: 2395-1958
IJOS 2017; 3(3): 667-672

www.orthopaper.com
Received: 03-05-2017
Accepted: 04-06-2017

Dr. Sudeep Madhukar Nambiar
DNB Ortho, D. Ortho. P.E.S Institute of Medical Sciences and Research, Andhra Pradesh, India

Dr. Naeem S Jagani
DNB Ortho. P.D. Hinduja National Hospital, Mumbai, Maharashtra, India

Dr. Lokesh Sharoff
DNB Ortho. Consultant Orthopaedic Surgeon, Nitin Multispecialty hospital, Mumbai, Maharashtra, India

Dr. Jonathan James D'souza
DNB Ortho, MNAMS Ortho. HIMSR and HAHC Hospital, New Delhi, India

Correspondence
Dr Jonathan James D'souza
DNB Ortho, MNAMS Ortho. HIMSR and HAHC Hospital, New Delhi, India

Total hip replacement the ideal joint for failed osteosynthesis of hip fractures

Dr. Sudeep Madhukar Nambiar, Dr. Naeem S Jagani, Dr. Lokesh Sharoff and Dr. Jonathan James D'souza

DOI: http://dx.doi.org/10.22271/ortho.2017.v3.i3j.102

Abstract
Introduction: Most proximal femoral fractures are successfully treated with internal fixation but a failed surgery can be very distressing for the patient due to pain and disability. For the treating surgeon it can be a challenge to perform salvage operations. Management of failed internal fixation of proximal hip fractures includes revision osteosynthesis or conversion total hip arthroplasty (THA). Total hip arthroplasty is generally accepted as the most successful salvage procedure for failure of these fixation devices. Conversion of failed hip surgeries to THA is indicated where the bone quality is poor, head is damaged due to previous internal fixation, poor bone stock, or limb shortening. Total hip arthroplasty in these patients may be difficult because of presence of previous implant, poor bone stock, scarred tissues and increased risk of infection.
Aim: The aim of this study was to analyze the short-term followup of functional results of 31 uncemented total hip replacement surgeries for failed osteosynthesis of hip fractures prospectively.
Materials and Methods: We had done 31 porous-coated uncemented total hip replacement surgeries in 29 patients for a variety of indications. The patients were reviewed regularly at 1 month interval for first 3 months, then at 6 months, 1 year and periodically thereafter for every 6 months. At the end of this study the patients were called back for review. Patients were reassessed clinically using the Harris hip score. X-rays of the hip were taken and were compared with the initial x-rays for signs of loosening, migration, wear and implant failure.
Results: All patients were evaluated clinically and radiologically preoperatively and at various followup periods. In our study, 15 hips showed excellent results, 10 hips showed good results, 3 hips showed fair results and 3 hips showed poor results. In a study performed by Kim YH *et al*, Seventy-five hips (65%) were excellent, 11 (9%) were good, and 30 (39%) were poor.
Conclusion: The uncemented total hip arthroplasty is the best choice of surgery for failed reconstructive surgeries of the proximal femur in individuals with good bone quality. As this is only a short term study, further follow-up and evaluation is essential to come out with a definitive conclusion.

Keywords: failed osteosynthesis, hip fractures, total hip arthroplasty

Introduction

Arthroplasty is an operation to restore pain- free motion to a joint and function to the muscles, ligaments and other soft tissue structures that control the joint [1]. The goals of total joint arthroplasty are to relieve pain, to provide motion while maintaining stability and to correct deformity [1].

Most proximal femoral fractures are successfully treated with internal fixation but a failed surgery can be very distressing for the patient due to pain and disability [2]. For the treating surgeon it can be a challenge to perform salvage operations [2]. The purpose of this study was to evaluate the short-term functional outcome and complications of total hip arthroplasty (THA) following failed fixation of proximal hip fracture. The human hip joint is extremely complex on account of the functional demands on it by the body [3]. On account of its complex biomechanics and important function, a stable painless hip is required for normal locomotion [3].

Due to increase in the aging population, the number of hip fractures in the elderly population is increasing [4]. The management of these fractures ranges from conservative method to osteosynthesis and primary replacement arthroplasty. More and more of these fractures are treated surgically by osteosynthesis for better rehabilitation and early return to function [4].

Various factors causing failure following osteosynthesis include osteoporosis, unstable fracture reduction or poor implant position [5].

Management of failed internal fixation of proximal hip fractures includes revision osteosynthesis or conversion total hip arthroplasty (THA). Total hip arthroplasty is generally accepted as the most successful salvage procedure for failure of these fixation devices. Conversion of failed hip surgeries to THA is indicated where the bone quality is poor, head is damaged due to previous internal fixation, poor bone stock, or limb shortening [6]. Total hip arthroplasty in these patients may be difficult because of presence of previous implant, poor bone stock, scarred tissues and increased risk of infection [6].

Total Hip Arthroplasty is the most commonly performed adult reconstructive hip procedure [7]. Implanting an artificial femoral head and acetabular socket to replace the degenerated / destroyed hip joint will relieve the pain and provides pain free, mobile and stable joint [1].

Total hip arthroplasty has been considered as one of the most revolutionary advances in the history of orthopaedics[8]. The total hip arthroplasty may be cemented or uncemented. Historically the long term results of cemented total hip arthroplasty show loosening which continues to be a basic complication [8]. Thus, there has emerged the concept of biological fixation rather than fixation with methylmethacrylate [8]. The overall results of press fitting alone were not good enough to consider as a sole method of fixation. With the advent of porous coated implants, which allow bone to penetrate the surface of the prosthesis and secure it, thus provide complete fixation and better results [9].

Since it has been proved that the primary surgery stands the best chance of long term success, it should be done with utmost technical precision. Proper patient selection, implant selection and implantation are very essential for the successful outcome of the surgery [10].

The purpose of this study was to evaluate the short term functional outcome, technical difficulties, complications associated with hip arthroplasty performed after failed fixation of proximal hip fractures.

Aim

The aim of this study was to analyze the short-term followup of functional results of 31 uncemented total hip replacement surgeries for failed osteosynthesis of hip fractures prospectively, done in our institution during the period May 2012 to May 2014.

Materials and methods

This is a prospective study conducted at Department of Orthopaedic Surgery, MIOT Hospital, Chennai-3 during the period from May 2012 toMay 2014. We had done 31 porous-coated uncemented total hip replacement surgeries in 29 patients for a variety of indications.

Table 1: Implant used

Implants	No. of Hips	Percentage
S rom system from depuy	23	74%
Kinnective from zimmer	8	26%

S rom system femoral stem is a straight, symmetrical stem. The surface of the stem is extensively porous-coated. The average pore size is 250 microns. The stem features a self-locking taper which accepts various sizes of femoral head. The head is made of Zirconia, the toughest and smoothest orthopaedic ceramic. The Duralocacetabular shell is primarily fixed with poro-coat and additionally with cancellous screws and duraloc polyethylene liner is used.

Kinnective non-cemented stem system comprises a double-cone straight stem with a rectangular cross-section. The stability of primary fit of plus-fit cup is enhanced by triple radius profile, and exact conformity between the smooth inside of the cup shell and the PE insert.

Post op protocol

The patients were nursed in post operative ward with the hip positioned in approximately $15^0$of abduction using abduction pillow in the immediate post operative period.

Bed exercises and limited mobilization was started on the first post operative day. Deep breathing, quadriceps and gluteal isometrics and gentle rotation exercises were begun. Drains were removed between 24 and 48 hours after surgery. Antibiotics were given parenterally for first 5 days and then orally for next 5 days. Suture removal was done between 10 and 12 days postoperatively.

The patients were allowed protected weight-bearing for approximately 12 weeks. This includes six weeks on a pair of crutches or walker and another six weeks on either one crutch or one cane. The duration of protected weight bearing is dependent upon the following 3 factors:

1. Bone quality
2. Estimate of tightness of fit of implants during surgery.
3. Appearance of immediate post-operative x-rays.

Patients were instructed to use an elevated toilet seat and to use one or two ordinary pillows between the knees when lying on the unoperated side and not to sit with legs crossed on the floor.

Follow-up

The patients were reviewed regularly at 1 month interval for first 3 months, then at 6 months, 1 year and periodically thereafter for every 6 months. At the end of this study the patients were called back for review. Patients were reassessed clinically using the Harris hip score. X-rays of the hip were taken and were compared with the initial x-rays for signs of loosening, migration, wear and implant failure.

The duration of follow up at the end of this study ranged from 4-20 months, with an average of 12 months.

Results

In this study, we have analysed the functional results of the porous-coated uncemented total hip arthroplasty, done in 31 hips of 29 patients, at Department of Orthopaedic Surgery, MIOT Hospital, Chennai-3 during the period from May 2012 toMay 2014.

Table 2: Sex ratio

Sex	No. of Patients	Percentage
Male	18	64%
Female	11	36%

Table 3: Age

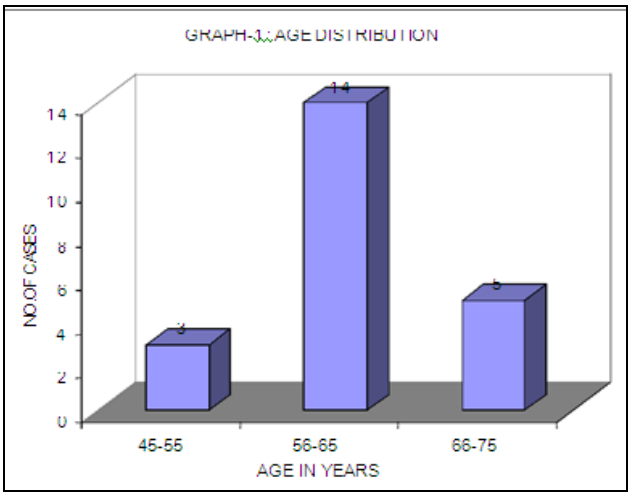
Age in years	No. Of cases	Percentage
45-55	5	14
56-65	17	64
66-75	7	22

Majority of the patients i,e. 17 (64%) were in the age group of 55-65 years followed by 7 (22%) patients in age group of 66-

75yrs and least were 3 (14%) patients in age group of 45-55 yrs. The youngest patient was 48 yrs old and the oldest patient was 74 years. The mean age of our study was 60.99 years.

Table 4: Side involved

Side	No. of Hips	Percentage
Right	13	42%
Left	18	58%



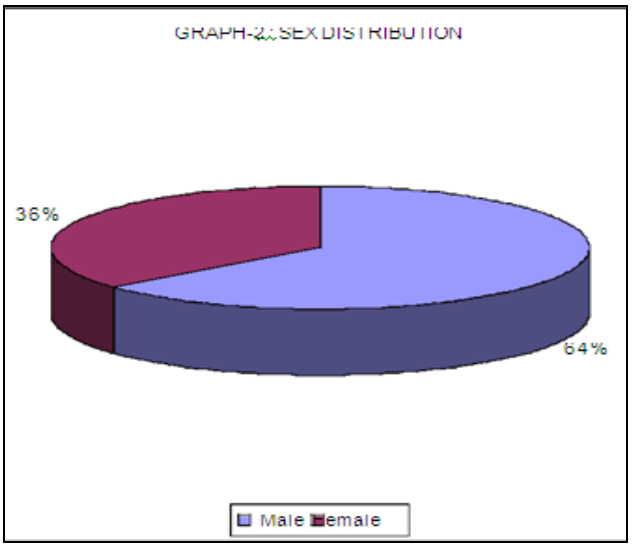


Table 5: Indications

Indications	No. Of cases	Percentage
Secondary osteoarthritis	15	44.8%
Avascular Necrosis	6	20.8%
Non union Neck of femur	4	13.8%
Early failure of fixation	4	13.8%
Trochanteric fracture non union	1	3.4%
Non union femoral head fracture	1	3.4%

Preoperatively, all the patients were evaluated using Harris Hip score. The preoperative score ranged from 11-46, with an average of 24.

Table 6: Surgical approaches used

Approach	No. of Hips	Percentage
Posterior (moore approach)	31	100%

Table 7: Position of patient during surgery

Position	No. of Hips	Percentage
Lateral	31	100%

All patients were evaluated clinically and radiologically preoperatively and at various followup periods. All the patients were analysed using Harris Hip Score evaluation, preoperatively and post operatively.
In our study, 15 hips showed excellent results, 10 hips showed good results, 3 hips showed fair results and 3 hips showed poor results.

Table 7: At the end of our study, the results were:

Results	No. of hips	Percentage
Excellent	15	48.4%
Good	10	32.2%
Fair	3	9.7%
Poor	3	9.7%

All the patients were analysed radiographically also during various follow up periods. The femoral stem and acetabular cup were assessed for its position, loosening, migration or implant failure.

Harris hip scoring system [11, 12]
Maximum points possible-100.

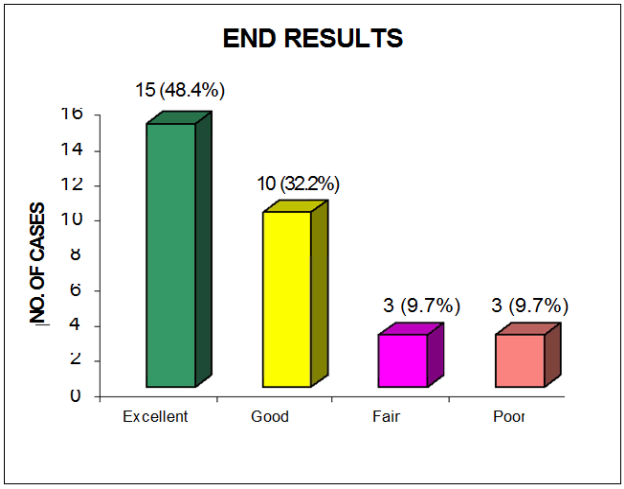
- Pain relief - 44
- Function - 47
- Range of motion - 5
- Absence of deformity - 4

100 points.

Total harris hip score

Table 8

Score	Rating
90-100	Excellent
80-89	Good
70-79	Fair
<70	Poor



In our study, one patient had subsidence of femoral stem of 3 mm in the proximal portion and the patient had thigh pain. One patient had migration of acetabular cup medially through the floor of the acetabulum.

Table 9: Correlation between state of femoral component and position of femoral stem

Position of femoral stem	Condition of the femoral stem		% of Loose femoral component
	Non-Loose	Loose	
Valgus	-	-	0%
Varus	-	-	0%
Neutral	30	1	3.2%

Table 10: Correlation between state of acetabular component and position of the cup

Position of ace tabular component	Condition of the ace tabular component		% of Loose ace tabular component
	Non-Loose	Loose	
Neutral	30	-	0%
Vertical	-	-	0%
Horizontal	-	1	3.2%

Harris hip score at the end of our study ranges from 65-98, with the average score of 87.

Table 11: Correlation between primary indication and hip score

Indications	Pre Operative	Post Operative	Improvement
Secondary osteoarthritis	23.7	83.1	59.4
Non union Neck of femur	28.3	91.7	63.4
Avascular Necrosis	23.0	89.0	66.0
Early failure of fixation	23.0	88.0	65.0
Trochanteric fracture nonunion	17.0	94.0	77.0
Non union femoral head fracture	15.0	81.0	66.0

In our study, we have not found any correlation between the indications of the surgery and the results.

Complications

In our study, the following complications were noted.

1. Subcutaneous Infection [13]

Two patients had infections over the suture line. It required pus culture and sensitivity tests. With appropriate antibiotics, the wounds healed by secondary intention.

2. Dislocation [14, 15]

One patient had dislocation of hip in immediate post operative period due to vertical placement of acetabular cup. This patient was reoperated and cup repositioning was done.

3. Subluxation [16]

It occurred in one case and treated with derotation boot and physiotherapy.

4. Intraoperative trochantenic fractures [17]

It occurred in one case. Peroperatively, the hip was not reducible and during manipulation, greater trochanter splintered. Cerclage wiring was done and the patient was allowed full weight-bearing after union of fracture.

5. Sciatic Nerve palsy [18, 19, 20]

One patient had sciatic nerve palsy since the immediate post operative period. The patient is using foot drop stop splint.

6. Subsidence [21]

One patient had subsidence of femoral stem during the followup visit at 21 months. She had thigh pain.

7. Migration of Implant [22]

Medial migration of acetabular cup through the acetabular floor occurred in one case.

8. Limb length discrepancy [23, 24, 25, 26]

Three patients had limb length discrepancy. One patient had 2cm shortening and two patients had 1.5cm shortening, for which heel and sole raise footwear was prescribed. One patient had 2cm false lengthening since she had malunitedsubtrochantenic fracture in the opposite limb.

Table 12

Complications	No. of hips	Percentage
Subcutaneous infection	1	3.2%
Dislocation	1	3.2%
Subluxation	1	3.2%
Intraoperative fracture femur	1	3.2%
Sciatic Nerve palsy	1	3.2%
Subsidence of femoral stem	1	3.2%
Migration of acetabular cup	1	3.2%
Limb length discrepancy	3	9.7%

Discussion

Total Hip Arthroplasty is one of the permanent method of relieving pain in the hip due to various conditions. The idea of performing the technique is to relieve pain, at the same time to preserve motion and stability of the joint. The role of surgical procedure has been extended dramatically to treat a wider variety of hip conditions.

Fractures of proximal femur have always presented great challenge to orthopaedic surgeons and remain the 'unsolved fracture' as far as treatment and results are concerned even today. With life expectancy increasing with each decade, our society is becoming a geriatric society with significant number of hospitalized and nursing home patients suffering from proximal afemoral fracture and their sequalae.

Nonunion and avascular necrosis or late segmental collapse is two principal complications of this fracture. The surgeon probably has less control over avascular necrosis than nonunion. All that the surgeon can do is that early anatomic reduction, impaction of fracture and rigid internal fixation. Even after this much effort by the surgeon there is no assurance that it will lead to an excellent result. Speed (1935) called the fracture of neck of femur as *"The unsolved fracture"* and Barnes (1962) *"The unsolvable fracture"*.

Various methods have been used for the internal fixation of the fracture of femoral neck taking consideration of the

above-mentioned complications. Failures following operative fixation of displaced fractures of the proximal femur has resulted in search of salvage procedures and probably the best salvage procedure now is fully uncemented total hip replacement.

The femoral neck fractures with retained internal fixation could be subdivided further into those fixed with simple screws or pins versus those fixed with a pin and plate device. Fractures fixed with pins or screws involved a relatively simple dissection, and the screws could be readily removed in most instances. In those fractures fixed with a pin and plate device, a more extensive dissection on the lateral side of the femur was required in order to remove the plate; on occasion, a slightly longer stem femoral component was required in order to bypass more distal screw holes.

Intertrochanteric fractures also posed considerable technical problems related in part to malunion of the proximal femur, superior migration of the greater trochanter, and obliteration of the proximal femoral medullary canal by new bone. In addition, a slightly longer stem femoral component frequently was required to bypass screw holes after hardware removal.

This study demonstrates that the functional outcome for patients undergoing total hip replacement for complications of proximal femoral fractures approximate the functional outcome of matched patients undergoing total hip replacement for degenerative arthritis or nontraumatic avascular necrosis. All patients were evaluated clinically and radiologically preoperatively and at various followup periods. The mean age of patients in our study was 60.4 years. These results were not observed in line with the results observed by Kim YH *et al* [10], in their study where the mean age was 60.4 years. This difference in age may be observed because our study dealt with a revision surgery while the study undertaken by Kim YH *et al* was a primary surgical study. In our study, 15 hips showed excellent results, 10 hips showed good results, 3 hips showed fair results and 3 hips showed poor results. In a study performed by Kim YH *et al* [10], Seventy-five hips (65%) were excellent, 11 (9%) were good, and 30 (39%) were poor.

In a study undertaken by Coventry *et al* [13], arthroplasty-related complications included dislocation, spontaneous subluxation, loosening of acetabular or femoral components, sciatic and femoral-nerve palsy and superficial and deep wound infections. Various studies undertaken by many researchers showed almost similar results related to complications observed [14-26].

The strength of this study are that all hips were uncemented, all were done using a uniform technique, done by same set of surgeons and no patient lost for follow up. The major weakness inherent in the study is that the sample size is less and the follow-up duration is not very long so as to demonstrate the long term follow up of these patients.

Conclusion

The uncemented total hip arthroplasty is the best choice of surgery for failed reconstructive surgeries of the proximal femur in individuals with good bone quality. The learning curve for the total hip arthroplasty to produce better results of this surgery is fairly big. The use of porous coated implants had better primary stability and also later with bone ingrowth, superior bond strength at the implant interface. This allows the porous coat to withstand loads which, in other systems, might result in a breakdown of surface coating. The bond strength and high coefficient of friction assure rigid, mechanical stability which is an essential factor for bone ingrowth.

The preferred surgical approach is by posterior Moore approach and the position is lateral position, especially for the surgeons in the learning curve, since the surgeon will have better three-dimensional orientation. The success of hip arthroplasty is predicted on proper patient selection, use of well designed implants and skilled technical execution of the procedure. As this is only a short term study, further follow-up and evaluation is essential to come out with a definitive conclusion.

References

1. Dorey FJ, Mckellop HA. In Finerman G A M, Dorey F J, Grigoris P, Mckellop H A (edtr) The long-term evaluation of Total hip arthroplasty: The need for survivorship analysis. Total hip arthroplasty outcomes, Churchill livingstone, newyork. 1998, 275-81.
2. Asnis SE, Wanek-Sgaglione L. Intracapsular fractures of the femoral neck. Results of cannulated screw fixation. J Bone Joint Surg Am. 1994; 76:1793-1803.
3. Garden RS. The structure and function of the proximal end of the femur. Journal of Bone and Joint Surgery. 1961; 43-B:576-589.
4. LaVelle DG. Fractures of hip. In: Campbell's Operative Orthopaedics, 10th, Canale ST. (Ed), Mosby, Philadelphia, 2003, 2873.
5. Lu-Yao GL, Keller RB, Littenbrg B, Wennberg JE. Outcomes after displaced fractures of the femoral neck: A meta-analysis of one hundred and six published reports. J Bone Joint Surg Am. 1994; 76:15-25.
6. Winemaker M, Gamble P, Petruccelli D, Kaspar S, de Beer J. Short term outcomes of total hip arthroplasty after complications of open reduction internal fixation of hip fracture. J Arthroplasty. 2006; 21:682-8.
7. Finerman GAM, Dorey FJ, Grigoris P, Mckellop HA. Commentary. In Finerman G A M, Dorey F J, Grigoris P, Mckellop H A (edtr). Total hip arthroplasty outcomes, Churchill livingstone, newyork, 1998, 3-12.
8. Harris WH, McCarthy JC, O' Neil DA. Femoral component loosening using contemporary techniques of femoral cement fixation. Journal of Bone and Joint Surgery. 1982; 64A:1063.
9. Kim YH, Seoul Korea. Longterm results of the cementless porous-coated anatomic total hip prosthesis, British Journal of Bone and Joint Surgery. 2005, 87-B. ISSN 0301-620X; 623-627.
10. Kim YH, Kim JS, Cho SH. Primary total hip arthroplasty with a cementless porous-coated anatomic total hip prosthesis; 10-12 year results of prospective and consecutive series; J. Arthroplasty, 1999; 14(5):538-48.
11. A Statistical analysis of hip scores, By Bryant MJ, Kernohan WG, Nixon JR and Mollan RA; Journal of Bone and joint Surgery(British). 1993; 75(5):705-9.
12. The reliability of hip scoring system for total hip arthroplasty candidates-Kirmit L, Karatosun V, Unver B, Bakirhan S, Sen A, Gocen Z-ClinRehabil, 2005; 19(6):659-61.
13. Coventry MB, Beckenbaugh RD, Nolan DR, Ilstrup DM. 2012 total hip arthroplasties: a study of postoperative course and complications. jbjs. 1974; 56A:273.
14. Woo RY, Morrey BF. Dislocation after total hip arthroplasty. Jbjs, 1982; 64A:1295.
15. William JF, Gottesman MJ, Mallory TH. Dislocation after total hip arthroplasty: treatment with an above-knee hip spica cast. ClinOrthop. 1982; 171:53.

16. Stauffer RN. Ten year follow up study of total hip replacement, with particular reference to roentgenographic loosening of the components. Jbjs 1982; 64A:1983.
17. Ritter MA, Gioe TJ, Steinger EA. Functional significance of non union of the greater torochanter. ClinOrthop, 1981; 159:177.
18. Weber ER, Daube JR, Coventry MB. Peripheral neuropathies associated with total hip arthroplasty. Jbjs 1992; 58A:66.
19. Nercessian OA, Gonzalez EG, Stinchfield FE. The use of somatosensory evoked potential during revision of reoperation for total hip arthroplasty. Clinorthop, 1989; 243:138.
20. Simmons C, Izant TH, Rothman RH. Femoral neuropathy following total hip arthroplasty: anatomic study, case reports, and literature review. J Arthroplasty. 1991; 6:59.
21. Amstutz HC. Complications of total hip replacement. I. skeletal fixation and loosening of total hip replacements. Instr course lect. 1974; 23:201.
22. Bragdon CR, O'connor DO, Muratoglu OK. A new polyethylene with undetectable wear at 12 million cycles, transactions of 24th annual meeting of the society for biomaterials, 1998; 21:2.
23. Abraham WD, Dimon JH. Leg length discrepancy in total hip arthroplasty. Orthop Clin North Am, 1992; 23:201.
24. Edeen J, Sharkey PF, Alexxander AH. Clinical significance of leg-length inequality after total hip arthroplasty. Am J Orthop. 1995; 4:347.
25. Williamson JA, Reckling FW. Limblength discrepancy and related problems following total hip replacement. Clin Orhtop. 1978; 134:135.
26. Woolson ST, Haarris WH. A method of introspective limb length measurement in total hip arthroplasty. ClinOrthop. 1985; 194:207.