International Journal of Orthopaedics Sciences

ISSN: 2395-1958
IJOS 2019; 5(2): 223-226

www.orthopaper.com
Received: 05-02-2018
Accepted: 08-03-2018

Dr. Ankush Goyal
Assistant Professor, Department of Orthopaedics, Adesh institute of Medical Sciences and Research Bathinda, Punjab, India

Dr. Amrinder Singh
Assistant Professor, Department of Orthopaedics, Adesh Institute of Medical Sciences and Research Bathinda, Punjab, India

Correspondence
Dr. Amrinder Singh
Assistant Professor, Department of Orthopaedics, Adesh Institute of Medical Sciences and Research Bathinda, Punjab, India

Assessment of efficacy of charnley type and modular type total hip prosthesis in patients undergoing total hip arthroplasty: A comparative study

Dr. Ankush Goyal and Dr. Amrinder Singh

DOI: https://doi.org/10.22271/ortho.2019.v5.i2e.24

Abstract
Background: 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. Evaluation of the long-term outcomes of an operative procedure is important to determine the durability of the results of the procedure. In addition, it provides a mean for comparison with the results of any changes in the procedure, including alterations in operative technique, implant design, type of joint - cemented and non-cemented hybrid that occur over times. Hence; we evaluated the results of total hip arthroplasty specially comparing most commonly performed modular type with charnley type i.e. fixed type of THR. In our institute modularity in respect to neck length is used.
Materials & methods: 30 patients of either sex, who were operated for total hip replacement, were assessed. Each case was subjected to detailed history regarding age at operation, sex, indication of surgery, type of replacement, duration after replacement, any associated comorbid condition that may affect outcomes of total hip replacement, whether joint replacement was unilateral / bilateral. A scoring system used by Harris called as Harris hip scoring system was used to evaluate the patients. 100 points will be given to a person who can painlessly walk without any support or limp and the walkable distance should not be limited. All the results were analyzed by SPSS software.
Results: 2(13.33%) patient in Charnley Group developed dislocation which was managed by closed reduction and traction for 6 weeks. 1(6.67%) Patient in Charnley Group developed peri prosthetic fracture which was managed by open reduction and internal fixation with plating and circlage wire. No patient in the group both groups had shortening more than 2 cms. There was no lengthening in any of the patients. The average Harris Hip Score in Modular Group patients was 85.67 and in Charnley Group was 79.87.
Conclusion: Since appreciable limb length shortening and dislocation of hip after fixed type is seen in this study so our results shows that Modular type of hip prosthesis is better than fixed type prosthesis (Charnley type hip prosthesis).

Keywords: Arthroplasty, charnley, modular

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. Originally the primary indication for total hip arthroplasty was alleviation of incapacitating pain in patients older than 65 years of age who could not be relieved sufficiently by non-surgical means and for whom the only surgical alternative was reconstruction of hip joint, of secondary importance was the improved function of the hip [1- 3].
Absolute contraindication for total hip arthroplasty include active infection of hip joint or any other region and any unstable medical illness that would significantly increase the risk of morbidity or mortality. Relative contraindications include any process that is rapidly destroying bone, neurotrophic arthritis, an absence or relative insufficiency of abductor musculature, and rapidly progressive neurological disease [4, 5].
The cement mantle and interfaces have been cited as weak links in fixation of femoral components for total hip replacement (THR). Aseptic loosening at the cement - prosthesis interface has been a primary mode of failure leading to secondary indication of implant subsidence, cement mantle failure and osteolytic response at the cement bone interface [6, 7].

Aseptic loosening continues to play the most significant role in the failure of cemented total hip arthroplasty. When using contemporary cementing technique, the incidence of aseptic acetabular component loosening was high as compared to the incidence of aseptic femoral component loosening. Primary concern was the high incidence of mechanical loosening and the extensive bone loss sometimes associated with fragmented cement [8].

Evaluation of the long-term outcomes of an operative procedure is important to determine the durability of the results of the procedure. In addition, it provides a mean for comparison with the results of any changes in the procedure, including alterations in operative technique, implant design, type of joint - cemented and non-cemented hybrid that occur over times. This is especially true for the total hip arthroplasty procedure. Present study is to evaluate the results of total hip arthroplasty specially comparing most commonly performed modular type with charnley type i.e. fixed type of THR. In our institute modularity in respect to neck length is used. The various neck lengths used are medium, short (-3.5mm) and long (+3.5mm) neck.

Material and Methods

In this follow up study the Cohort comprised of 30 patients of either sex, who were operated for total hip replacement in the Department of Orthopaedics at Govt. Rajindra Hopital, Patiala.

Method of study

1. Each case was subjected to detailed history regarding age at operation, sex, indication of surgery, type of replacement, duration after replacement, any associated comorbid condition that may affect outcomes of total hip replacement, whether joint replacement was unilateral / bilateral.
2. Evaluation of Functional / Clinical Outcome

A scoring system used by Harris called as Harris hip scoring system [9] was used to evaluate the patients. The sum of the points is then multiplied 0.05 to obtain the number of points for overall evaluation of the range of motion.

Results were graded as under

Excellent - 90-100
Good - 80-90
Fair - 70-80
Poor - <70

Criteria for Evaluation

Patients will be evaluated as per modified Harris hip scoring system. Modified Harris Hip scoring system includes assessment of both the hip joint itself and functional score that rates the patient's ability to walk and carry out daily activities.
Total Score allotted is 100
Two parameters are directly related to assessment of hip joint itself i.e

i) Absence of deformity- 04 points
ii) Range of motion score- 05 points

Rest 91 points are allotted to functional parameters of patients.

Thus 100 points will be given to a person who can painlessly walk without any support or limp and the walkable distance should not be limited. Also the said person should be able to enter public transport, put on shoes and socks with ease, climb stairs normally without using railing and should be able to sit comfortably in ordinary chair for about 1 hour. Beside his/her range of motion of hips joint must be between 211-300 degrees and any deformity should be absent.

Results

The age of the patients ranged from 40 years to 78 years. The average was 60.23 years. Most of the patients were in 5th & 6th decade. Mean age in Modular group was 59 years. Mean age in Charnley group was 61.46 years. There were 9(60%) males and 6(40%) females in Modular group. The male to female ratio in Modular group was 3: 2. There were 9 (60%) males and 6 (40%) females in Charnley group. It was found that avascular necrosis (due to various etiologies) accounted for maximum number of cases. 7(46.6%) cases in Modular group and 6(40%) cases in Charnley group were of AVN. 5(33.33%) cases in Modular group and 4(26.67%) cases in Charnley group were due to Osteoarthritis of hip. 3(20%) cases in Modular group and 5(33.33%) cases in Charnley Group were due to fracture neck of femur. The patients were followed up for a maximum of 60 months and a minimum of 15 months with the maximum number of cases in 31-50 months group of follow up in both the groups. Average of all cases comes out to about 40 months of follow up in Modular Group and 42 months in Charnley Group. 1(6.67%) patient in Charnley Group developed urinary tract infection which was successfully managed by proper antibiotic coverage after culture and sensitivity and increased hydration. 1(6.67%) patient in Modular Group developed loosening of femoral component. It was managed by revision with longer stem.

2(13.33%) patient in Charnley Group developed dislocation which was managed by closed reduction and traction for 6 weeks. 1(6.67%) Patient in Charnley Group developed peri prosthetic fracture which was managed by open reduction and internal fixation with plating and cerclage wire. In this series 12 cases (80%) had no shortening and in 2 cases (13.33%) there was shortening up to 1cm in Modular group and 1(6.67%) patient had shortening more than 1 cms and less than 2 cms. In Charnley group 10 cases (66.67%) had no shortening while 3 cases (20%) had shortening upto 1 cm and 2 cases(13.33%) had shortening more than 1 cms.

No patient in the group both groups had shortening more than 2 cms. There was no lengthening in any of the patients. Out of 30 patients in this study, 13(87.67%) patients in Modular Group had good results and 9(60%) patients of Charnley Group had good results. 2 (13.67%) patients of Modular Group had fair result and 5(33.33%) of Charnley Group had fair result. None of the patient of Modular Group had poor result whereas 1(6.67%) of patient in Charnley Group had poor results.

The average Harris Hip Score in Modular Group patients was 85.67 and in Charnley Group was 79.87.

Table 1: Duration of Follow-Up

Months	Number of cases	
	Modular Group n(%age)	Charnley Group n(%age)
0 – 10	0(0%)	0(0%)
11 – 20	2(13.33%)	2(13.33%)
21 – 30	2(13.33%)	2(13.33%)
31 – 40	4(26.67%)	4(26.67%)
41 – 50	5(33.33%)	4(26.67%)
51 – 60	2(13.33%)	3(20%)
Total	15(100%)	15(100%)

Table 2: General Complications

Complications	No. of Cases(%age)	
	Modular Group	Charnley Group
No complication	15(100%)	14(93.33%)
Pleurisy	0(0%)	0(0%)
Broncho pneumonia	0(0%)	0(0%)
Cardiac failure	0(0%)	0(0%)
Pulmonary embolism	0(0%)	0(0%)
Coronary occlusion	0(0%)	0(0%)
Fat embolism	0(0%)	0(0%)
Paralytic ileus	0(0%)	0(0%)
Urinary infection	0(0%)	1(6.67%)
Total	15(100%)	15(100%)

Table 3: Local Complications

Complications	No. of Cases (percentage)	
	Modular Group	Charnley Group
No complication	14(93.33%)	12(80%)
Deep wound infection	0(0%)	0(0%)
Heterotopic ossification	0(0%)	0(0%)
Dislocation (traumatic)	0(0%)	2(13.33%)
Periprosthetic fractures	0(0%)	1(6.67%)
Loosening of cup	0(0%)	0(0%)
Loosening of femoral stem	1(6.67%)	0(0%)
End pain	0(0%)	0(0%)
Deep vein thrombosis	0(0%)	0(0%)
Sciatic nerve palsy	0(0%)	0(0%)
Vascular injury	0(0%)	0(0%)
Total	15(100%)	15(100%)

Table 4: Shortening

	Modular Group n (%)	Charnley Group n (%)
Nil	12(80%)	10(67.67%)
0-1 cms	2(13.33%)	3(20%)
1-2 cm	1(6.67%)	2(13.33%)
2-3 cm	0(0%)	0(0%)
Total	15(100%)	15(100%)

Table 5: Results Using Harris Hip Score

Results	Modular Group n (%)	Charnley Group n (%)
Excellent	(0%)	0(0%)
Good	13(87.67%)	9(60%)
Fair	2(13.33%)	5(33.33%)
Poor	0(0%)	1(6.67%)
Total	15(100%)	15(15%)

Discussion

Osteoarthritis as well as avascular necrosis of femoral head and fracture neck of femur are common orthopaedic problems of hip joint in a community and significant difference of opinion persist regarding the choice of modalities of treatment. 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 hip joint problems [10-12]. The patients were followed up for a maximum of 60 months and a minimum of 15 months with the maximum number of cases in 31-50 months group of follow up in both the groups. Average of all cases comes out to about 40 months of follow up in Modular Group and 42 months in Charnley Group. Statistically when both groups were compared, p value is not significant and it is.32.

Average duration of follow up in other series

Zoran and Cupic (1974) [13]	9 years
Colville and Rounio (1978) [14]	2.5 years
Delamarter and Moreland (1985) [15]	3.8 years
Hamadouche and Bolander (2002) [16]	18.5 years
Present series	3.4 years

Average duration of follow up in our series is comparable to Colville and Rounio (1978) [14] and Delamarter and Moreland (1985) [15] series.

Although longer follow up always give better results however average duration of follow up in our study is sufficiently long and its results are comparable with internationally published studies.

Complications

Peri-prosthetic fracture

There were one post traumatic periprosthetic fractures in Charnley Group. Mode of trauma was road traffic accident. Patient treated with open reduction and internal fixation with plating and circlage wire.

Loosening

1 hip (3.33%) in Modular group showed evidence of loosening. It was managed by revision with long stem.

There was no loosening in Charnley group.

Incidence of aseptic loosening in other series

Exeter series (1969) [17]	5%
Colville and Raunis (1978) [14]	34%
Omniflex series (1989) [18]	32%
Present series	3.33%

The lower incidence of aseptic loosening may be due to shorter duration of follow up compared to other series. Out of 30 patients in this study 13 (87.67%) patients in Modular Group had good results and 9(60%) patients of Charnley Group had good results. 2 (13.67%) patients of Modular Group had fair result and 5(33.33%) of Charnley Group patients had fair result. None of the patient of Modular Group had poor result whereas 1(6.67%) of patient in Charnley Group had poor results. Statistically when both groups were compared, p value is significant and it is.012.

	Good	Fair	Poor
Zoran Cupic series (1974) [13]	91%	6%	3%
Collaghan and Albright (2000) [19]	81%	15%	4%
Present series	73.33%	23.33%	3.33%

The results of our series is comparable to the Collaghan and Albright (2000) [19] series.

In our study shortening and dislocation was more common in Charnley type THR because it is fixed type and neck length cannot be varied intraoperatively.

There was one case of periprosthetic fracture in Charnley THR which occurred after significant trauma. This type of fracture can occur with any of the prosthesis after such a significant trauma.

There was one case of loosening in Modular THR as interface between cement and metal can give way and can cause aseptic loosening.

Since appreciable limb length shortening and dislocation of hip after fixed type is seen in this study so our results shows that Modular type of hip prosthesis is better than fixed type prosthesis (Charnley type hip prosthesis).

Conclusion

Since appreciable limb length shortening and dislocation of hip after fixed type is seen in this study so our results shows that Modular type of hip prosthesis is better than fixed type prosthesis (Charnley type hip prosthesis).

References

1. Harkess JW, Daniels AU. Arthroplasty - Introduction and overview. Campbell's Operative Orthopaedics. 10th ed. St. Louis: Mosby; 2003, 223-42.
2. Praemer A, Furner S, Rice DP. Musculoskeletal condition in the United States: Arthritis, Rosemont IL, American Academy of Orthopaedic Surgeons, 1999, 216-19.
3. Hey Groves EW. Modern methods of treating fractures. Bristol 1916, John Wright & Sons Ltd.
4. Moore AT. Intracapsular fractures of the hip joint, a new method of skeletal fixation. J South Carolina Med Assoc. 1934; 30:190-205.
5. Harkess JW. Arthroplasty of hip: Canale ST (ed.): Campbell's operative orthopaedics. 9th ed. Mosby, St. Louis, 1998, 296-300.
6. Charnely J. The binding of prosthesis to bone by cement. J Bone Joint Surg. 1964; 46-B:518.
7. Harris WH. Total hip arthroplasty in middle aged patient: Contemporary cementing for fixation of the femoral components. Orthop Clin North Am. 1993; 24(4):611-5.
8. Charnley J. Arthroplasty of the hip - a new operation. Lancet. 1961; 1:1129.
9. Bobyn JD, Tanzer M, Krygier JJ, Derjovne AR, Brooks CE. Concerns with modularity in total hip arthroplasty. Clin Orthop. 1994; 298:27-36.
10. Chmell MJ, Rispler D, Poss R. The impact of modularity of the total hip replacement. Clin Orthop. 1995; 319:77-84.
11. Hozack WJ, Mess JJ, Rothman RH. Head neck modularity for total hip arthroplasty. Is it necessary? J Arthroplasty. 1996; 11(4):397-9.
12. Bhan S, Pankaj A. War and Osteolysis. In: Bhan S, editor. Key Issue in Hip Arthroplasty. A MediWorld Publications, 38-43.
13. Cupic Z. Long term follow-up of Charnely arthroplasty of hip. Clin Orthop. 1979; 141:28.
14. Colville J, Raunio P. Charnley low friction arthroplasty of the hip in rheumatoid arthritis - a study of the complications and results in 378 arthroplasties. J Bone Joint Surg. 1978; 60B:498-503.
15. Delamarter R, Moreland JR. Treatment of acute femoral neck fractures with THA. Clin Orthop. 1987; 218:68-74.
16. Hamadouche M, Boutin P, Daussange J, Bolander ME, Sedel L. Alumina - on - Alumina total hip arthroplasty. A minimum 18.5 year follow-up study. J Bone Joint Surg. 2002; 84-A:69-77.
17. Ling RSM, Fowler JL. Experience with the exeter total hip replacement since 1970. Orthop Clin North Am. 1988; 19:477.
18. Capello. Omniflex modular femoral component - 2-5 year results. Clin Orthop Rel Res. 1994; 298:54.
19. Callaghan JJ, Albright JC, Goetz DD, Olejniczak JP, Johnston RC. Charnley Total Hip Arthroplasty with cement - minimum twenty five year followup. J Bone Joint Surg. 2000; 82-A:487-97.