Rehabilitation outcomes post cemented and cementless total hip replacements in patients with primary coxarthrosis: Comparative study

Naziru Bashir Mukhtar [1] A,B,C,DE,F, Bogusław Frańczuk [2] B,C,DE

[1] Department of Physiotherapy, Bayero University Kano
[2] Faculty of Physiotherapy, Vincent Pol University, Lublin, Poland

Abstract

Background: Degenerative and deformative changes of the hip joints rank among the most severe and most common musculoskeletal conditions affecting the elderly and reasonable number of these patients receive Total hip replacement (THR) with or without cement. The aim of this study was to assess outcomes of rehabilitation following cemented and cementless THR in patients with primary coxarthrosis, and also to compare the outcomes between the two groups to see if there will be any significant difference in the outcomes measured.

Materials and Methods: Twenty (20) patients were purposively recruited to participate in this study from a population of coxarthrosis patients billed to undergo THR. The patients were divided into two groups with 10 participants each to undergo either cemented or cementless THRs. The demographic parameters of all the participants were recorded. All the participants were administered Visual Analogue Scale (VAS), Harris Hip Scores (HHS), Western Ontario and McMaster Osteoarthritis Index (WOMAC) and Total Range of Motion (TROM) of the affected hip joints were measured before surgery and at the 7TH week after the surgery and rehabilitation and all the participants underwent similar rehabilitation post-surgery.

Results: 15 Females (75%) and 5 Males (25%) participated in the study, with the cemented group having 8 Females (80%) and 2 Males (20%), while the cementless group had 7 Females (70%) and 3 Males (30%). The mean ages of the participants were 72.10 and 61.70 years for the cemented and cementless groups respectively. All baseline parameters of the participants (Age, VAS, HHS, WOMAC and TROM) were comparable between the groups ($P>0.05$). There were significant improvements in post rehabilitation scores for VAS and HHS when compared to pre-THR scores in both groups ($P<0.05$). The post rehabilitation scores for TROM were significantly higher than the pre THR scores in the cementless group ($P<0.05$). However, no significant difference was found between the baseline and post rehabilitation WOMAC scores of both groups ($P>0.05$). Lastly, the results showed that the cementless group had significantly higher value at post rehabilitation for the TROM when compared to the cemented group ($P<0.05$).

Conclusions: It was concluded that; Rehabilitation improves the quality of life and pain in patients after Total Hip Replacement (THR) irrespective of the type of prosthesis used (cemented or cementless) and Cementless THR has showed better improvement in hip joint total range of motion after rehabilitation than the cemented THR.

Key Words: Coxarthrosis, Total Hip Replacement, Rehabilitation, Outcomes

Introduction

Degenerative and deformative changes of the hip joints rank among the most severe and most common musculoskeletal conditions. [1] The hip joint is particularly important functionally and prone to changes resulting from wear and tear of its surface. Degenerative changes in the hip not only impair its function, but also considerably limit overall physical performance of the body. [2] Besides arterial hypertension and vascular diseases, osteoarthritis is one of the most severe diseases of civilization with a prevalence of 12% in Europe and the United States, rising to 60% of the population over 65 years of age. [3] Most frequently it affects people over sixty years of age. Young people are usually diagnosed with secondary degenerative changes associated with previous joint disease or injuries. [4] The years 2000-2010 have been announced as the bone and joint decade by the World Health Organization and United Nations Organization. [1]

Conservative treatment of osteoarthritis is often palliative. [3] Due to an increase in the number of elderly people in ageing societies across Europe, as well as a growing number of young people taking up sports that place particularly high loads on joints (such as skiing, gym exercises or tennis), the number of people affected by osteoarthritis will probably rise. [3] Conservative treatments include medication (anti-inflammatory and analgesics) and physiotherapy. If conservative treatments fail, hip resurfacing or a hip replacement may be necessary. [5] Total hip replacement (THR) is one of the most successful and cost-effective of surgical procedures with the primary goals of pain relief and restoration of function. [6]

More than 600.000 hip replacement procedures are performed in Europe every year, and the ratio of hip replacement ranges from one procedures per 500 inhabitants per year in Germany to one procedure per 3000 inhabitants per year in Poland. [7]

Physiotherapy (rehabilitation) after total hip replacement is accepted as a standard and essential treatment. [8] Its aim is to maximize functionality and independence and to minimize complications such as wound infection, deep vein thrombosis, pulmonary embolism, and hip dislocation. [8] Although the intensity and frequency of the ideal rehabilitation protocol is unknown, early multidisciplinary rehabilitation improves outcomes. [9] The use of a comprehensive activity and rehabilitation tool may allow surgeons to predict the postoperative recovery course for patients for hip resurfacing as well as other arthroplasty treatments, and allow for a tailoring of rehabilitation treatments. Additionally, it may assist surgeons in providing guidance regarding which treatment modality may be most appropriate for a given patient. Further study is necessary to better define these potential benefits. [10] Prolonged physical impairments in range of movement, postural stability and walking speed are commonly reported following total hip replacement (THR). It is unclear from the current body of evidence what kind of exercises should be performed to maximize patient function and quality of life. [11] It was suggested that arthroplasties performed without cement were preferable to those with cement, especially in younger, more active individuals. To date, there is no consensus on the best fixation mode for THA. [12]

A lot of researches were carried out comparing the cemented and cementless total hip replacement but emphases were put on outcomes related to longevity, revision cases, dislocation, loosening, radiological successes etc. [13] but comparative researches regarding the outcomes of rehabilitation among the different types of total hip replacement are very rare. A review of the literature suggested that little work has been undertaken to evaluate the individual contributions of each regime on outcome. [14] Using continuous passive motion (CPM) machine in the rehabilitation of total hip

replacement shorten the time for gaining full range of motion in the affected joint and also shortens the hospitalization period when compared to the conventional rehabilitation group. [15] Also the use of CPM machine and Isometric exercises help in regaining maximum gross muscle power (GMP) [16] and Full range of motion (ROM) faster after THR. [17] Published studies comparing cemented to uncemented THRs are rare. The majority of these are retrospective, nonrandomised comparisons or comparison in the same patient with bilateral THRs. So far no single study has been able to draw a decisive conclusion because of inherent limitations. [6]

Most of other researches that compared the effect of rehabilitation techniques in THR treated the topic in general not comparing different types of THR, as such, there is need to have more researches that will compare the effects of different rehabilitation regimes on different types of total hip replacements so as to have evidence based knowledge on the response to rehabilitation among different types of total hip replacements, as such, this serves as the background of the study.

Materials and Methods

All patients that were booked for total hip replacement in the months of January and February, 2014 at the Krakow Centre of Rehabilitation and Orthopaedics (Krakowskie Centrum Rehabilitacji i Ortopedii) constituted the study population, because of the design being experimental and also due to the constraint of time, only 20 patients were recruited (10 patients from each of cemented and cementless THR) by purposive sampling technique using the inclusion criteria of THR due to primary osteoarthritis of the hip joint and only patients with Unilateral THR procedure, patients with other serious medical problems that can limit their participations were excluded.

Ethical approval for the research was obtained from the centre as appropriate, before the commencement of the research, the questionnaires, written informed consent form, with a supporting letter from the hospital were given to each of the participants. The researcher explained the objectives and relevance of the study and assured the participants of anonymity and gave them the option of not participating in the study if they wish.

All the sampled patients completed the HHS questionnaire, WOMAC questionnaire, VAS and had their range of motions (flexion, abduction, adduction, internal and external rotations) in the hip measured using Universal Goniometer before undergoing the surgical procedure and also at the 7th week after the surgery (during review), other relevant demographic information of the patients were documented including; Age, Gender, Height, and Weight.

12 hours after the surgery, the rehabilitation programmes were commenced.

1st Day of Surgery, the following programmes were given: Education plus therapeutic/preventive positioning for the patients, deep breathing and blowing exercises and isometric exercises for the quadriceps muscle of the affected lower limb and both gluteal muscles (each exercise had 20repititions and was repeated 3 times a day).

2nd Day of Surgery, the exercises of the day 1 were continued, then active exercises of the un affected limbs were incorporated plus the active exercises of the ankle/foot of the affected lower limb and partial weight bearing (PWB) standing exercises using walking frame (to the level of patients' tolerance)

3rd Day of Surgery, Continuous Passive Motion (CPM) Machine exercise were commenced on this day, supine lying position was used, The CPM is set at start range of 0 degrees of hip and knee flexions, and increases to range of 40 degrees of hip flexion or more as tolerated by patient, the speed is set at gentle limit while the angle of flexion is increased by 5-10

degrees every five to ten minute continuously for one hour (twice a day). PWB Crutch walking was commenced the same day using pair of elbow crutches on the floor and progressing to the stair climbing.

From the 4th day to the 7th day the same exercise programmes were continued and at the end of the 7th day patients were discharged home and similar isometric and active exercises were prescribed as home programmes and they also received adequate guidance on positioning.

Two weeks after discharge they come back for stitch removal and 4 weeks after removal (7weeks after surgery) they come back for review during which we collected the post rehabilitation data.

Simple descriptive statistic of means and standard deviation were used to describe the distribution of the participants' demographic characteristics.

Student t-test (independent and paired) was used to compare the outcomes of rehabilitation between the two types of THR and also between the pre and post rehabilitation scores among the groups. The significance level was set at 95% ($P<0.05$) and the analysis was made using start graphics centurion version 15.2.11.0 by PP.

Results

The study group was composed of 20 patients (10 each for cemented and cementless THRs), consisting of 15 Females (75%) and 5 Males (25%), 13 of them had right THR (65%) and the left THR makes up the remaining 7 (35%).

The cemented group consisted of 8 Females (80%) and 2 Males (20%) with 7 Right THR (70%) and 3 Left THR (30%), While the cementless group had 7 Females (70%) and 3 Males (30%) with 5 Right THR (50%) and 5 Left THR (50%). The details are presented in the tables and figures.

The demographic parameters of the participants were presented in Table 1. The findings of the study has shown that there was no significant difference ($P>0.05$) in the baseline scores (VAS, WOMAC, HHS and TROM) and also the Age of the participants between the Cemented and Cementless groups (Tables 2&3). There were significant improvements in post rehabilitation scores for VAS and HHS when compared to pre-THR scores in both groups ($P<0.05$) as can be seen in Tables 5, 6, 7 and 8. The post rehabilitation scores for TROM were significantly higher the pre THR scores in the cementless group ($P<0.05$) as presented in Table 8. However, no significant difference was found between the baseline and post rehabilitation WOMAC scores of both groups ($P>0.05$) as shown in Tables 7 and 8. The post Rehabilitation scores of VAS, WOMAC and HHS of the Cemented group were not significantly different from that of the Cementless group ($P>0.05$) as shown in Tables 3 and 4. Lastly, the results showed that the cementless group had significantly higher value at post rehabilitation for the TROM when compared to the cemented group ($P<0.05$) as presented in Table 3. Figures 1, 2 and 3 presented the summarized distribution of the data.

Discussion

Total hip replacement is one of the most frequently performed orthopaedic interventions that can significantly improve the functional status and the quality of life of patients suffering from hip arthritis [18, 19]. Recently patient satisfaction and patient-reported results of total hip arthroplasty has being increasingly emphasised as important tools during the assessment and management of these interventions [19].

The aim of the study was to assess selected outcomes of rehabilitation following cemented and cementless total hip replacement in patients with primary coxarthrosis, and also to compare the outcomes between the two groups to see if there will be any significant difference in the outcomes measured, with a view to finding out procedure with better rehabilitation and functional outcomes in the patients.

The participants of this study had a mean age of 72.10 and 61.70 years for the cemented and cementless THR groups respectively, which was comparable across the two groups. This is in line with the information in previous studies that have revealed a high prevalence of coxarthrosis among elderly individuals. [20, 21, 22, 23] The study also showed that there was a preponderance of female individuals compared to males (75% of the participants being females while 25% males). This finding may not be far from the nature of the past reported prevalence of more females having Osteoarthritis at advanced ages and also more subsequent THRs than males. [21, 23, 24] It may also be due to the fact that Women are more likely than men to seek for treatment.

The result of this study showed that there was a significant improvement in the post rehabilitation pain (assessed using VAS) level across the two groups when compared with pre operative baseline. Thus, further emphasizing the effectiveness of rehabilitation as buttressed in past studies [15, 17, 25, 26] The results also showed a similar trend between the two groups in their post intervention VAS scores which was also reported in previous studies [26, 27]. This similarity may be due to the corrective nature of the surgery despite differences in the materials, as the major cause of pain in most arthritis is the degenerated articular components in the joint which were replaced in both procedures. [21].

The result of this study also showed that there was a significant improvement in the post rehabilitation HHS level across the two groups when compared with pre operative baseline of the participants. Other studies reported early significant improvement in HHS after THR from the 3rd through the 6th post operative months [28] Having significant improvement of HHS after 7th week following Rehabilitation shows support for the effectiveness of Rehabilitation on several Quality of life outcomes after THR as published in past studies. [15, 25] There was no significant difference in the improvement when the two groups are compared, contrary to the published studies suggesting better short term clinical and functional outcomes in the cemented THR patients when compared with the cemented ones. [8]. this may suggest that, with adequate rehabilitation, the outcomes may significantly improve irrespective of the type of prosthesis used.

The outcome of this study revealed that there was no significant improvement in the post rehabilitation disability index score (assessed using WOMAC scale) across the two groups when compared with pre operative baseline. Studies have detected improvement in the WOMAC scores after THR [29]. But the review periods used were longer than the one used in this research and this may mean, WOMAC scores may require longer time than HHS for significant improvement to be detected.

This study also showed that, there was a significant improvement in the post rehabilitation total range of motion (ROM) in the cementless THR group when compared with pre operative baseline while no significant improvement was seen in the cemented group. This result can be attributed to the effectiveness of rehabilitation (CPM Machine exercises inclusive) as was reported in previous studies [15,16,17] this finding is also supported by the findings of a previous study for the cementless intervention which reported better outcomes, but at a longer review time [30]. However, the results show a significantly higher improvement among the patient in the cementless group when compared with those of the cemented upon post intervention comparison. This difference may be due to the constituents of the surgery material between the two procedures. As no known published study was found comparing the rehabilitation outcomes after the two surgical interventions.

One of the main limitations of this study is the low number of the recruited participants. However because of the low age range and similar

demographic characteristics of the participants the results is a reflection of the outcomes that may be displayed on a larger scale. Another, limitation is that most of the outcomes were subjectively assessed using questionnaires; however none of the patients had any history of cognitive related abnormalities.

The better outcome in the TROM of the cementless group warrants further exploration. Also Demonstrating the Positive effect of Rehabilitation post surgery in THR patients will hopefully lead to an increased awareness and the investigation of possible confounders to the interventions across various populations of patients.

Conclusions

Based on the findings of this study, it was concluded that:

- ❖ Rehabilitation improves the quality of life in patients after Total Hip Replacement (THR) irrespective of the type of prosthesis used (cemented or cementless)
- ❖ Rehabilitation did not have any early significant impact on the WOMAC outcomes of patients following THR
- ❖ Cementless THR has significantly better improvement in hip joint range of motion after rehabilitation than the cemented THR.

References:

1. Hawrylak A, Weigel D, Barczyk K, Ostrowska B, Ratajczak B. Impact of treatment on selected functional parameters in patients after hip joint replacement surgery – preliminary report. *Fizjoterapia Polska* 2010; 3(4); Vol. 10, 222-233.

2. Wojcik B, Jablonski M, Gebala E, Drelich M. A comparison of Effectiveness of Fascial Relaxation and Classic Model of Patients Rehabilitation after Hip Joint Endoprosthetics. *Ortopedia Traumatologia Rehabilitacja* 2012; 2(6); Vol. 14, 161-178.

3. Pop T, Szczygielska D, Druzbicki M, Zajkiewicz K. Epidemiology and cost of conservative treatment of patients with degenerative joint disease of the hip and knee. *Ortopedia Traumatologia Rehabilitacja* 2007; 4(6); Vol. 9, 405-412

4. Pruszczynski B, Sibinski M, Synder M. Outcomes of Hip Arthroplsty in Patients Younger than 28 Years Old. *Ortopedia Traumatologia Rehabilitacja* 2011; 3(6); Vol. 13, 261-269

5. Kallala R, Anderson P, Morris S, Haddad F S. The cost analysis of cemented *versus* cementless total hip replacement operations on the NHS. *Bone Joint J* 2013; 95-B: 874–6.

6. Abdulkarim A, Ellanti P, Motterlini P, Fahey T, O'Byrne J. Cemented versus Uncemented fixation in Total Hip Replacement: A systematic review and Meta analysis of randomized control trials. Orthop Rev (Pavia). 2013 February 22; 5(1): e8.

7. Eingartner C. Current trends in Total Hip Arthroplasty. *Ortopedia Traumatologia Rehabilitacja* 2007; 1(6); Vol. 9, 8-14.

8. Smith G H, Johnson S, Ballantyne J A, Dunstan E, Brenkel I J. Predictors of excellent early outcome after total hip arthroplasty. *J Orthop Surg Res*. 2012; 7:13.

9. Tyrose G, Newmann D, Slover J, Jaffe F, Hunter T, Bosco J. Rapid Mobilization Decreases Length-of-Stay in Joint Replacement Patients. Bulletin of the Hospital for Joint Diseases 2013; 71(3):222-6

10. Marker D R, Seyler T M, Bhave A, Zywiel M G, Mont M A. Does commitment to rehabilitation influence clinical outcome of total hip resurfacing arthroplasty? *J Orthop Surg Res.* 2010; 5: 20.

11. Monaghan B, Grant T, Wayne H, Cusack T. Functional exercise after total hip replacement (FEATHER) a randomised control trial. BMC *Musculoskelet Disord*. 2012; 13: 237.

12. Corten K, Bourne R B, Charon K D, Keegan A U, Rorabeck. What Works Best, a Cemented or Cementless Primary Total Hip Arthroplasty? Minimum 17-year Follow up of a Randomized Controlled Trial. *Clin Orthop Relat Res* (2011) 469:209–217.

13. Pakvis D, van Hellemondt G, de Visser E, Jacobs W, Spruit M. Is there evidence for a superior method of socket fixation in hip arthroplasty? A systematic review. International Orthopaedics (SICOT) (2011) 35:1109–1118.

14. Smith TO, Mann CJV, Clark A, Donell ST. Bed exercises following total hip replacement: a randomised controlled trial. *Physiotherapy* 94 (2008) 286–291.

15. Wilk M, Frańczuk B. Rehabilitation of patients after hip arthroplasty using continous passive motion. *Fizjoterapia Polska* 2005; 1; Vol. 5, 8-14.

16. Wilk M, Frańczuk B. Analysis of changes in the strength of muscles acting on the hip joint in patients recovering from hip arthroplasty. *Fizjoterapia Polska* 2003; 4; Vol. 3, 309-315.

17. Wilk M, Frańczuk B. Evaluating changes in the range of movement in the hip joint in patients with degenerative changes, before and after total hip replacement. *Ortopedia Traumatologia Rehabilitacja* 2004; 3; Vol. 6, 342-349.

18. Skolimowska B, Barczyk K, Mraz M, Ostrowska B. Functional characteristics of the lower limbs in women with coxarthrosis following implantation of the hip joint endoprosthesis. *Fizjoterapia* 2005; 13, 1, 39-47.

19. Zuh SG, Nagy Ö, Zazgyva A, Russu OM, Gergely I, Pop T S. Correlations between the Harris Hip Score and the Visual Analogue Scale in the assessment of total hip replacement in hip dysplasia. *ARS Medica Tomitana;* April 2014 Volume 20, Issue 1, Pages 6–13, ISSN (Online) 1841-4036,

20. Alfonso DT, Howell RD, Strauss EJ, Di Cesare PE. Total Hip and Knee Arthroplasty in Nonagenarians The Journal of Arthroplasty 2007; Vol. 22 No. 6.

21. Osteoarthritis in General practice, data and perspectives. Arthritis Research UK, July 2013 www.arthritisresearchuk.org

22. Li Y, Wei X, Zhou J, Wei L. The Age-Related Changes in Cartilage and Osteoarthritis BioMed Research International Volume 2013 (2013), Article ID 916530, 12 pages

23. Felson DT, Nevitt MC. Epidemiologic studies for osteoarthritis: new versus conventional study design approaches. *Rheum Dis Clin N Am* 30 (2004) 783 – 797.

24. Ruiz D, Koenig L, Dall TM, Gallo P, Narzikul A, Parvizi J, Tongue J. The Direct and Indirect Costs to Society of Treatment for End-Stage Knee Osteoarthritis**.** The Journal of Bone and Joint Surgery (American)*,* 2013; 95 (16): 1473.

25. Starowicz A, Szwarczyk W, Wilk M., Frańczuk B. The evaluation of quality of life among patients after total hip replacement. *Fizjoterapia Polska* 2005; 3 Vol. 5, 313-322.

26. Kim Y. Bilateral cemented and cementless total hip arthroplasty. *The Journal of Arthroplasty* June 2002; Volume 17, Issue 4, Pages 434–440

27. Mardani-Kivi M, Karimi M., Asadi K , Hashemi-Motlagh K , Saheb-Ekhteiari K. Comparison of outcomes of total hip replacement in elderly patients using cemented vs. cementless techniques Minerva Ortopedica e Traumatologica February2013; 64(1):83-8.

28. Ng CY, Ballantyne JA, Brenkel I J. *J Bone Joint Surg* [Br] 2007; 89-B:868-73.

29. Judge A, Cooper C, Williams S, Dreinhoefer K, Dieppe P. Arthritis Care & Research April 2010; Vol. 62, No. 4, pp 480 – 488.

30. Hozack WJ, Rothman RH, Booth RE Jr, Balderston R A. Cemented versus cementless total hip arthroplasty. A comparative study of equivalent patient populations. *Clin Orthop Relat Res*. 1993; Apr;(289):161-5.

LIST OF TABLES

Table 1. Descriptive Table for Cemented and Cementless THR Groups

Variables	Cemented		Cementless	
	M	SD	M	SD
Age (Years)	72.10	10.32	61.70	12.03
Weight (Kg)	63.60	5.84	82.30	11.68
Height (M)	1.60	0.65	1.67	0.83
BMI (Kg/ M²)	24.73	2.05	29.38	4.06

M=Mean, SD=Standard Deviation, THR=Total Hip Replacement

Table 2. Comparison of the Age between the Cemented and Cementless THR Groups

Variables	Cemented		Cementless			
	M	SD	M	SD	t	p
Age (Years)	72.10	10.32	61.70	12.03	2.075	0.053

M=Mean, SD=Standard Deviation, THR=Total Hip Replacement, P=level of significance (P<0.05)

Table 3. Comparison of baseline scores between the cemented and cementless THR groups and the Post Rehabilitation outcomes between the cemented and cementless THR groups

Method: 95% level of significance		
Scores	Count	Mean
Pre-Op HHS (cemented)	10	31
Pre-Op HHS (cementless)	10	40.8
Post-Rehab WOMAC (cementless)	10	44.6
Post-Rehab HHS (cemented)	10	47.7
Post-Rehab WOMAC (cemented)	10	50.5
Post-Rehab HHS (cementless)	10	57.4
Pre-Op WOMAC (cemented)	10	59.9
Pre-Op WOMAC (cementless)	10	65.6
Pre-Op TROM (cemented)	10	107
Pre-Op TROM (cementless)	10	116.5
Post-Rehab TROM (cemented)	10	117.5
Post-Rehab TROM (cementless)	10	142.5

Contrast		range	Sig.
Pre-Op WOMAC (cemented)- Pre-Op WOMAC (cementless)		5.7	15.5061
Post-Rehab WOMAC (cemented)- Post-Rehab WOMAC (cementless)		5.9	15.5061
Pre-Op HHS (cemented)- Pre-Op HHS (cementless)		-9.8	15.5061
Post-Rehab HHS (cemented)- Post-Rehab HHS (cementless)		-9.7	15.5061
Pre-Op TROM (cemented)- Pre-Op TROM (cementless)		-9.5	15.5061
Post-Rehab TROM (cemented)- Post-Rehab TROM (cementless)	*	**-25**	**15.5061**
WOMAC= Western Ontario and McMaster Osteoarthritis Index, HHS=Harris Hip Scores, TROM=Total Range of Motion, Pre-Op=Pre Operative, Post Rehab=Post Rehabilitation	*** denotes a statistically significant difference for P<0,05**		

Table 4. Comparison of VAS improvement between the cemented and cementless THR groups

Summary Statistics			
VAS improvement RESULTS FOR CEMENT Hip		VAS improvement RESULTS FOR CEMENTLESS hip	
Count	10	Count	10
Average	**30,3**	Average	**43,4**
SD	15,5424	SD	23,1142
Minimum	5	Minimum	7
Maximum	60	Maximum	75
Range	55	Range	68
Stnd. skewness	0,225033	Stnd. skewness	-0,433595
Stnd. kurtosis	0,408505	Stnd. kurtosis	-0,697648

P-Value (Mean) = 0,119367

P-Value (Median) = 0,504983

VAS=Visual Analogue Scale

Figure 1 Comparison of VAS improvement between the groups

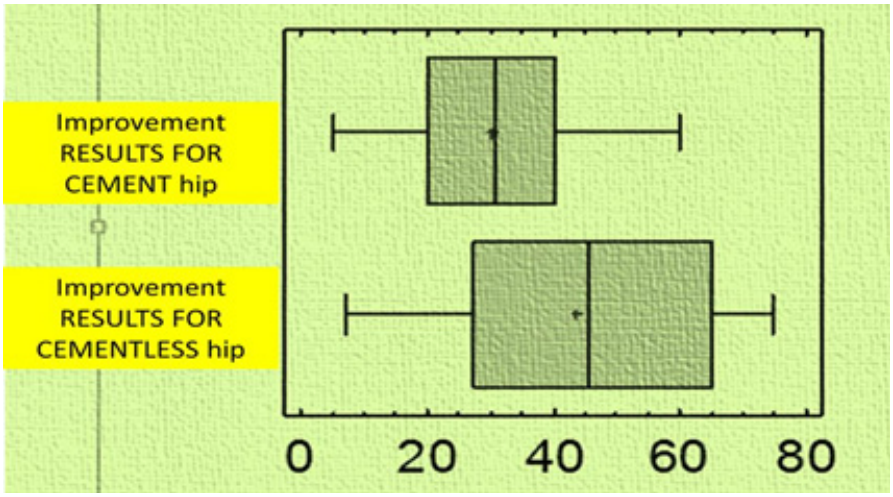


Table 5. within group comparison of pre and post rehabilitation scores of VAS in the Cemented THR group

Summary Statistics

	VAS BEFORE SURGERY	VAS AFTER REHABILITATION
Count	10	10
Average	**70.3**	**40.0**
Standard deviation	15.1221	11.6333
Minimum	50.0	15.0
Maximum	100.0	50.0
Range	50.0	35.0
Stnd. Skewness	0.838659	-1.59218
Stnd. Kurtosis	0.11078	0.624788
P-Value (Mean)		0.000165721*

*=Significant difference at (P<0.05), VAS=Visual Analogue Scale

Table 6. Summary Statistics of VAS in the Cementless group

	VAS BEFORE SURGERY	VAS AFTER REHABILITATION
Count	10	10
Average	**74.3**	**30.9**
Standard deviation	20.4236	12.0964
Minimum	50.0	12.0
Maximum	100.0	48.0
Range	50.0	36.0
Stnd. Skewness	0.25602	0.498221
Stnd. Kurtosis	-1.32178	-0.52602
P-Value (Mean)		0.000218661

VAS=Visual Analogue Scale

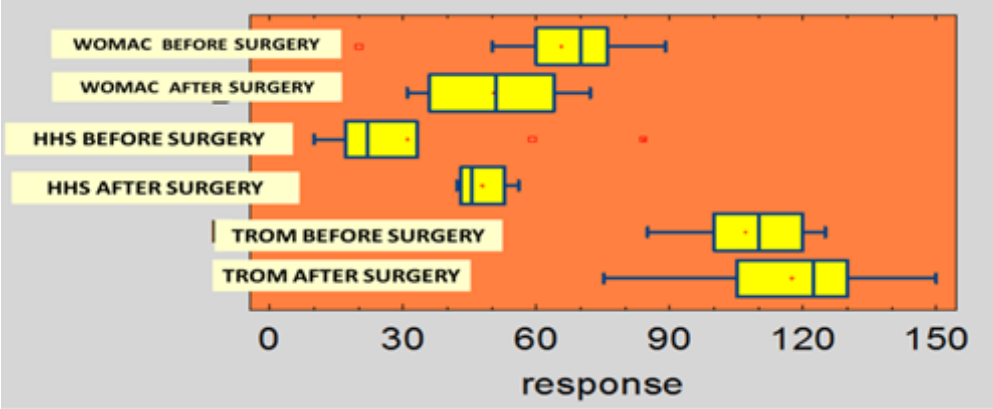
Table 7. within group comparison of pre and post rehabilitation scores in the Cemented THR group

	Count	Average	Standard deviation	Coeff. of variation	Minimum	Maximum	Range
WOMAC Pre-Op	10	65.6	19.7495	30.11%	20	89	69
WOMAC Post-Op	10	50.5	15.1456	29.99%	31	72	41
HHS Pre-Op	10	31	23.4852	75.76%	10	84	74
HHS Post-Op	10	47.7	5.77446	12.11%	42	56	14
TROM Pre-Op	10	107	13.1656	12.30%	85	125	40
TROM Post-Op	10	117.5	22.5154	19.16%	75	150	75

	Count	Mean
WOMAC Pre-Op	10	65.6
WOMAC Post- Rehab	10	50.5
HHS Pre-Op	10	31
HHS Post- Rehab	10	47.7
TROM Pre-Op	10	107
TROM Post- Rehab	10	117.5
Contrast	Sig.	Difference
WOMAC Pre-Op v WOMAC Post- Rehab		15.1
HHS Pre-Op **v HHS** Post- Rehab	*	**-16.7**
TROM Pre-Op v TROM Post-Rehab		-10.5
* denotes a statistically significant difference (P<0.05)		

WOMAC= Western Ontario and McMaster Osteoarthritis Index, HHS=Harris Hip Scores, TROM=Total Range of Motion, Pre-Op=Pre Operative, Post-Rehab=Post Rehabilitation

Figure 2 Distribution of WOMAC, HHS and TROM at baseline and after rehabilitation in the Cemented group



HHS=Harris Hip Score, WOMAC= Western Ontario and McMaster Osteoarthritis Index, TROM=Total Range of Motion

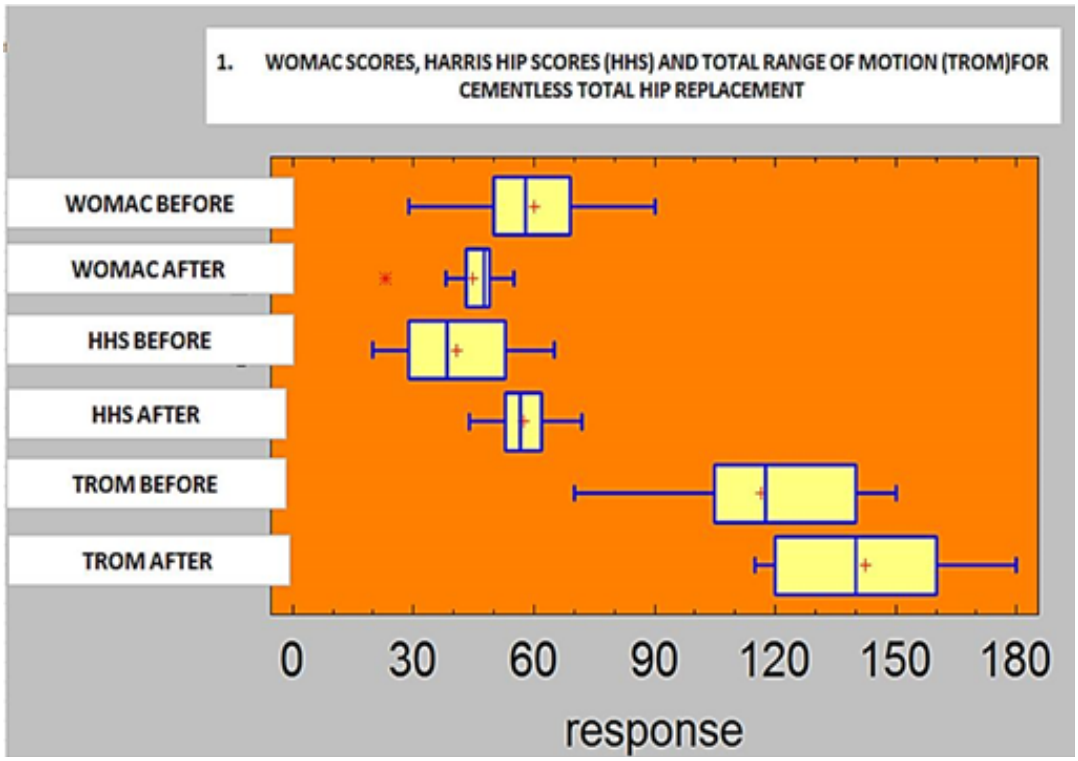
Table 8. within group comparison of pre and post rehabilitation scores in the Cementless THR group

summary statistic						
	Count	Average	SD	Minimum	Maximum	Range
WOMAC BEFORE SURGERY (%)	10	59.9	16.67	29	90	61
WOMAC AFTER SURGERY AT 7TH WEEK (%)	10	44.6	8.82	23	55	32
HHS BEFORE SURGERY	10	40.8	14.06	20	65	45
HHS AFTER SURGERY AT 7TH WEEK	10	57.4	7.37	44	72	28
TROM BEFORE SURGERY	10	116.5	26.98	70	150	80
TROM AFTER SURGERY AT 7TH WEEK	10	142.5	21.25	115	180	65

Multiple Range Tests		
Contrast	Sig.	Difference
WOMAC BEFORE SURGERY (%) -WOMAC AFTER SURGERY (%)		15.3
HHS BEFORE SURGERY - HHS AFTER SURGERY	*	**-16.6**
TROM BEFORE SURGERY - TROM After SURGERY	*	**-26**
*** denotes a statistically significant difference. P<0,05**		

WOMAC= Western Ontario and McMaster Osteoarthritis Index, HHS=Harris Hip Scores, TROM=Total Range of Motion

Figure 3



Correspondence address:
Naziru Bashir Mukhtar B.Sc. (PT), M.Sc. (PT)
Address: Department of Physiotherapy, Bayero University Kano.
Phone number: +2348069442044
E-mail Address: nazirpt@yahoo.com