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Single-use versus reusable ancillaries for dual mobility cup in total hip replacement. A prospective randomized short-term safety and feasibility comparison

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Abstract

Background:

Single-use (SU) ancillaries for cup preparation in total hip arthroplasty (THR) aim to reduce the costs of hip replacement surgery. These devices have been recently introduced, but their safety and feasibility have not been studied. Therefore, we performed a prospective randomized study aiming to assess the impact in our department of using these SU ancillaries versus standard reusable ancillaries for dual mobility THR regarding 1) the cost, 2) Operative time, 3) Quality of primary fixation.

Hypothesis:

We hypothesized that the use of SU ancillaries for acetabular preparation would reduce maintenance costs, and so optimise the operating procedure, reduce the overall cost of surgery, save time, while maintaining the same quality of prosthesis fitting.

Method:

We conducted a randomised, controlled, open-label, two-arm, single-centre, prospective therapeutic trial with a medico-economic objective. Inclusions were made prospectively from patients hospitalised and surgically managed in our department for arthrosis over 18 years old treated with dual mobility THR.

Results:

In the current study, 18/20 (90%) of the cases required the use of one SU reamer when using SU ancillaries. Only two cases (10%) required a second SU reamer (without SU failure

regarding the acetabular implant) because there was too much subchondral bone left and not enough cancellous bone allowing correct cup fitting. We also found that the test implant supplied in the SU kit had a less secure press-fit than the reusable metal test implants. There was one of primary press-fit failure in the SU group requiring a different cup with additional screws. The estimated cost to the supplier per procedure was 20,105 euros using single-use reamers versus 26,666 euros using conventional ancillary kits, a saving of 6561 euros ($p < 0.001$). For the healthcare institution, the median price per intervention on the differentiating points was 2648 euros versus 2580 euros, with no significant difference ($p = 0.297$). The results show an average societal cost of 52,199 euros using single-use and 53,572 euros using reusable ancillary equipment, with a significant difference between the two groups ($p < 0.003$). The average cost of Healthcare Risk Waste (HCRW) disposal in the SU group was 5.2 euros per intervention against 5.1 euros in the RU group, without significant difference ($p = 0.910$). We found a similar result for the cost of disposal of non-HCRW waste per procedure: 0.37 euros in the SU group versus 0.34 in the RU group, without significant difference ($p = 0.345$).

Conclusion:

SU ancillaries significantly reduce the table set up time and have the potential to facilitate time and cost savings but further research is needed in this direction. Our study shows that the daily workload, operating times, and the number of boxes of instruments to be sterilised are decreased. The associated environmental gain is significant. Nevertheless, the economic promise of these SU ancillaries is only partially supported in this trial owing to the small number of patients. Further work will be needed to obtain a more powerful medico-economic assessment of this promising ancillary product.

Level of evidence: II; prospective randomized study

Key words: total hip prosthesis; reusable ancillary; single use

Clin Trials : [NCT04903860](https://www.clinicaltrials.gov/ct2/show/study/NCT04903860)

1. Introduction

In France, each year more than 160,000 patients undergo total hip arthroplasty [1,2]. This surgery, which has been called the “operation of the century” [3,4], makes it possible to restore hip function and painless mobility in patients with arthrosis [5]. The number of people undergoing surgery is constantly increasing as the population ages [1]. The increasing societal cost of treating this disease and the decreasing price of treatment year-on-year have prompted the companies distributing these prostheses to find ways to make savings [6].

One answer is single-use (SU) ancillaries. In the operating theatre, basic surgical equipment has been SU for many years (drapes, scalpels, compresses, suction, saw blades, meniscus suture kit, osteosynthesis materials) [7]. The SU concept itself is not new, but its use in orthopaedics remains exceptional in total hip replacement (THR), especially for a dual mobility cup, the long-term results of which are known [8–14]. This evolution towards all-SU ancillaries is still slow and held back by force of habit and the potential additional costs incurred. An ancillary kit is a medical device in its own right, with its own costs: purchase and maintenance costs borne by suppliers or distributors, and sterilisation costs borne by healthcare facilities [15]. Today, in most healthcare facilities, ancillary kits are supplied free of charge by manufacturers. A French supplier has recently developed an SU ancillary kit for the fitting of a dual mobility cup in total hip arthroplasty [16].

The aim of our work was to study the impact in our department of using these SU ancillaries versus standard reusable ancillaries for dual mobility THR regarding 1) the cost, 2) operative time, 3) quality of primary fixation. We hypothesized that the use of SU ancillaries for acetabular preparation would reduce maintenance costs, and so optimise the operating procedure, reduce the overall cost of surgery, save time, while maintaining the same quality of prosthesis fitting.

2. Materials and methods

2.1 Recruitment

We conducted a randomised, controlled, open-label, two-arm, single-centre, prospective therapeutic trial with a medico-economic objective, comparing two referenced medical devices for surgical use. Inclusions were made prospectively from patients hospitalised and surgically managed in the orthopaedic department of Clermont-Ferrand University Hospital from 13 July 2021 to 27 July 2022 with a three-month follow-up for each patient. This was a Type 2 Human Subjects Research trial (minimal risks and constraints) approved by our Ethics Committee (CPP No. 21-CHCF-02). The project was submitted to clinical trials (NCT04903860).

The inclusion criteria were as follows: over 18 years of age, eligible for a primary THR for isolated coxarthrosis, health insurance coverage, and informed consent after explanation of the protocol and perusal of a written summary of the surgical procedure and the successive stages of follow-up.

2.2 Course of the protocol

After giving consent, each patient was included and randomised using RedCap™ (University Vanderbilt; Nashville, USA) software into either of the two trial arms. Stratification on BMI > or < 24 was performed to obtain a homogeneous distribution of this variable in each group.

Various functional measurement scores were then made by the surgeon to best assess the patient's pain, function, mobility, and activity level prior to surgery (VAS, Postel and Merle d'Aubigné (PMA) score [17], Harris score [18], Charnley [19], and Devane score [20] Western Ontario and McMaster University Osteoarthritis (WOMAC) index [21] and Hip Disability and Osteoarthritis Outcome Score (HOOS) [22]) (table 1).

Detailed information was collected during surgery: time spent setting up the operating table, duration of the procedure, total duration of room occupation, mass (by weighing bins) of infectious healthcare risk waste (HCRW) and non-HCRW, number of SU reamers used, operator satisfaction (scale 0–10), and the duration of all stages of the sterilisation process in our facility. The latter comprised several steps before the instruments

were available again in the operating theatre: pre-disinfection, sorting, washing-disinfection, kit recomposition, packing, sterilisation, and storage.

We also analysed all the complications that occurred during surgery and their respective costs. The patients in the study were followed up in consultation at 3 months.

2.3 Description of surgical technique

Preoperative planning with OrthoView™ (Materialise, Hampshire, United Kingdom) software was performed on frontal pelvic radiographs with a standardised scale (radio-opaque ball). This planning enabled us to evaluate the size of the acetabulum after determining the theoretical centre of rotation of the head and the rear of the acetabular cavity. This measurement was refined during the operation with a calliper to determine the size of the final implant to be chosen.

When using the reusable ancillaries, the preparation of the acetabulum was started with a small-calibre reamer to hollow out the rear of the acetabulum and then with reamers of increasing diameter to enlarge the cavity.

When using the SU ancillaries, the acetabulum was prepared with an SU reamer according to the value determined in the preoperative planning, combined with femoral head diameter data measured intra-operatively [23]. The single use comprised one box for the reamer and another box for the cup. In the SU technique, the surgeon is supposed to use only one reamer.

2.4 Description of implants and ancillaries

The conventional reusable ancillaries consisted of three trays: 1 box of Quattro cup ancillaries, 1 box of acetabular reamers, and 1 box for the femoral stem ancillary (this last was used in both arms of the study) (Figure 1).

The SU ancillaries comprised a sterile-packaged SU specific reamer, a set of phantom cups and specific SU test balls for one acetabular cup size, plus a reducer, an impactor, and a guide rod (Figure 2).

The acetabular cup used in our trial, supplied by the Lépine company (Genay, France), was a cobalt-chromium alloy double hemispherical mobility cup. It has a bioactive coating of

titanium and hydroxyapatite applied by vacuum plasma spraying. Its rotational stability is enhanced by equatorial fins with or without tropical spikes according to the model (Quattro HAP VPS and PF) (Figure 3). The polyethylene is highly crosslinked [23,24] and already embedded with the head. The Pavi™ HAP stem (Lépine company, Genay, France) is a self-locking titanium alloy femoral stem, cemented or non-cemented was used in both groups. The sterilization process is on-site. We perform a mean of 5 hip arthroplasties a day in our center.

2.5 Statistics

The number of subjects needed was calculated based on the comparison of costs between the groups. Assuming a power of 90% and an alpha risk of 5%, and assuming a cost of 140 € for the SU group versus 220 € for the reusable group, and standard deviations of about 50 € for the SU group and 80 € for the reusable group, at least 20 subjects per group were needed. We thus planned to include a total of 40 patients in our study.

Statistical analyses were performed with Stata v15 software (StataCorp, College Station, TX, USA). All tests were two-tailed, with a fixed type-I error of 5%. Continuous data are presented as mean \pm standard deviation or median [interquartile range]. Categorical data are presented as frequency and percentage.

Given the near-zero risk of attrition, the main analysis was conducted on an intention-to-treat (ITT) basis to compare the randomised groups with regard to the direct costs of care. Our primary endpoint was the overall cost generated per intervention. There was one deviation from the original planned protocol that required an additional per-protocol analysis, which revealed no significant difference. The results presented in this study are those of the ITT analysis. Comparisons were made using Student's *t*-test conditional on the normality of the data distribution, or else the Mann-Whitney test. This analysis was complemented by a multivariate analysis using a linear regression model to adjust for factors that potentially impact on costs, and on the randomisation group. The results are presented as regression coefficients with their 95% confidence intervals. The validity of the model was checked by analysing the normality of the residuals. Transformations (e.g. log) were envisaged for non-normal distribution of costs. The normality of the distributions was analysed graphically and using the Shapiro-Wilk test.

3. Results

3.1 Trial population

A total of 40 patients were analysed, 20 of whom were randomised to the single-use (SU) group and 20 to the reusable (RU) group (Figure 4). We had no missing data. There was one protocol deviation with the last patient initially randomised to the RU group undergoing total hip replacement with SU owing to human error. Follow-up was three months for all patients. The full data set of the randomised population is given in Table 2 with the *p*-values and distribution of each group. The two groups were comparable for sex, age, BMI, preoperative VAS, and all preoperative functional scores (Table 2).

3.2 Complications

The overall complication rate in this study was 7.5% (n=3). Complications were peri-prosthetic fracture (2.5%) (n=1), early surgical site infection (SSI) (2.5%) (n=1) and failure to fit the final cup (2.5%) (n=1) (requiring a different cup with additional screws). All these complications occurred in the SU arm, with no statistically significant difference (*p* = 0.231) from the RU group.

The femoral peri-prosthetic fracture, which occurred in a fall at 10 days post-op, required redo surgery with replacement of the femoral implant with a new stem and metal cerclage wiring with no impact on the cup. The overall cost of this redo surgery was estimated at 3614 euros.

The patient who presented an early SSI of the surgical site at D15 of the initial surgery, initially underwent a debridement and implant retention (DAIR) with replacement of the moving parts of the implant. Unfortunately, owing to unfavourable clinical evolution, new surgery was needed to remove the whole prosthesis and perform a one-stage exchange. These two successive operations resulted in additional costs estimated at 5216 euros.

In the case of the failure of the final cup, we opted for an additional cup used, it was a press-fit dual mobility cup associated with a screw fixation system. This initial failure resulted in an increase of 2373 euros in the overall cost of the procedure.

3.3 Economic data

Practical use

In our trial, 18/20 (90%) of the cases required the use of one SU reamer when using SU ancillaries. Only two cases (10%) required a second SU reamer (not the acetabular implant) because there was too much subchondral bone left and not enough cancellous bone. We also found that the test implant supplied in the SU kit had a less secure press-fit than the reusable metal test implants. As noticed earlier there was one of primary press-fit failure in the SU group requiring a different cup with additional screws.

Regarding the relationship between preoperative planning and final acetabular implant size, we found perfect agreement in 62.5% of cases (25/40) with a Cohen's Kappa coefficient of 0.9193 in the SU group versus 0.8886 in the RU group. Systematic measurement of the size of the femoral head intra-operatively made it possible to determine the exact size of the definitive acetabulum in 90% of cases.

Savings for the manufacturer

The average design price of a standard reusable ancillary kit is approximately 20,000 euros (5000 euros for the cup box, 5000 euros for the acetabular reamers and 10,000 euros for the femoral stem ancillary). We note that in France, the ancillary equipment is either made available free of charge in advance by the supplier when implant surgery activity is sufficiently high or loaned on an *ad hoc* basis. For our trial, the calculation of the depreciation of the ancillaries was based on an average of 50 fittings/year/kit associated with a duration of 3 years, implying a yearly decrease of 1/3 in the value (wear, maintenance, and replacement parts). In comparison, the average price of an SU reamer is 50 euros, to which must be added the price of the SU test kit (50 euros) and a common base for the reusable ancillary equipment for the femoral stem (10,000 euros). Finally, the estimated cost to the supplier per procedure was 20,105 euros using SU reamers versus 26,666 euros using conventional ancillary equipment, i.e. a saving of 6561 euros ($p < 0.001$).

Savings for healthcare facilities

The current estimated cost of operating room time is 12.26 euros per minute in France. The time saved in the operating room when using SU was 4 minutes in our trial (56 minutes versus 60 minutes) with no significant difference ($p = 0.271$). Operating room costs related to the duration of the procedure were estimated in the SU group at 700 euros versus 743 euros in the RU group, with no significant difference ($p = 0.448$). The price of prosthetic implants was the same in the two groups (1739 euros). The calculation of the cost of sterilising medical devices was based on the department's annual operating accounts, which include all the expenditure of the sterilisation department (maintenance, water, electricity, personnel, etc.). In our trial, the average cost of sterilisation generated by the entire SU procedure was 116 euros versus 132 euros for the RU, with a statistically significant difference ($p < 0.005$).

Counting all the costs generated during this trial borne by the healthcare facility (sterilisation, waste disposal, equipment used, operating room time, complications), in the SU arm, the median price per procedure was 2648 euros against 2580 euros in the RU arm, with no significant difference ($p = 0.297$). The total care cost savings per THR were estimated at approximately 68 euros.

Savings for society

From a societal point of view, counting all the average costs generated per procedure (including those borne by the healthcare facility and manufacturers) and hospitalisation costs, we found an average cost of 52,199 euros using SU ancillaries and 53,572 euros using reusable ancillaries, with a significant difference between the two groups ($p < 0.003$). The small difference was due to the complications that occurred only in the SU group.

Environment and workload

There is an obvious gain in handling when using SU ancillaries, as the number of boxes is halved (4 versus 2). The saving in terms of handling was estimated at 10 kg per

operation (2×5 kg). Less handling also means that the theatre nurse saves time setting up the instrument table. When patients were randomised to the SU arm, the time taken to set up the operating table was 4.24 minutes on average versus 10.40 minutes in the RU arm ($p < 0.001$) (Figure 5). The number of boxes of ancillary equipment is halved when using an SU kit (2 instead of 4), resulting in savings of water and electricity during the sterilisation process. An autoclave cycle consumes an average of 250 litres of water and 15 kW of electric power to produce the steam needed for its operation, and washing an ancillary box uses 45 litres of water and 10 kW of power. Any reduction in the number of autoclave loads thus has a positive impact on cost and on the environment.

As regards waste disposal, the use of the SU reamer and the SU test kit generated approximately 130 g of cardboard packaging, plastic, insert, and labelling, all of which was discarded in the non-infectious waste stream, and 55 g of polymer ancillary, which went into the infectious HCRW stream. The average mass of HCRW waste per procedure in our study was 5942 g, with no significant difference between the two groups ($p = 0.759$). Similarly, the average mass of non-HCRW waste was 1384 g per intervention, with no significant difference between the two groups ($p = 0.235$). The cost of waste disposal was estimated at 859 euros/metric ton including tax for HCRW and 258 euros/metric ton including tax for non-HCRW in our institution. The average cost of HCRW disposal in the SU group was 5.2 euros per intervention against 5.1 euros in the RU group, with no significant difference ($p = 0.910$). We found a similar result for the cost of disposal of non-HCRW waste per procedure: 0.37 euros in the SU group versus 0.34 in the RU group, with no significant difference ($p = 0.345$).

3.4 Radiograph analysis

The radiological analysis in our trial was based on AP pelvic radiographs with the incident beam centred on the pubic symphysis. The magnification factor was adjusted using a metal ball of constant diameter or by the known size of the implants. The initial image was obtained during the preoperative consultation. For each patient, an intermediate image was taken immediately post-surgery and the final image was taken at the 3-month postoperative consultation. We found no statistically significant difference in femoral offset, acetabular offset, or centre of rotation height between the SU and RU groups (Table 3).

In our trial, there was no evidence of any acetabular or femoral peri-prosthetic border at 3 months. No granuloma or peri-prosthetic osteolysis was found in the radiographic analysis. There was no migration of the acetabulum.

3.5 Analysis of clinical scores

Operator satisfaction during this study was on average $6.8/10 \pm 1.5$ [4 – 9], with no significant difference between the two groups with 6.6 for RU and 6.9 for SU ($p = 0.578$). The postoperative VAS at 3 months was on average 1.4 ± 1.1 [0 – 6] with no significant difference between the two groups with 1.1 for RU and 1.9 for SU ($p = 0.214$). We found a mean improvement of 37 points in the Harris score ($p = 0.898$) and a decrease of 36 points in the WOMAC score ($p = 0.898$), and 37 points in the HOOS score ($p = 0.636$), with no significant difference between the two groups. For the PMA score, an improvement of 6 points with a mean value of 14.8, with no significant difference between the two groups ($p = 0.473$) was found (table 1).

4. Discussion

Hospitals are seeking innovative ways to reduce overall costs while maintaining or improving overall quality of care. In this trial, we showed that SU ancillaries had a slightly lower overall cost than conventional reusable ancillaries. Several trials have sought to demonstrate the advantages of SU ancillaries. One such trial found no increase in overall costs when using SU ancillaries for the treatment of fractures of the lower end of the radius [7]. Other clinical trials have estimated a cost reduction of \$140–220 per surgery when using patient-specific instruments and an operating time saving of approximately 30 minutes for total knee replacement [24]. Modelling suggests that the potential cost savings may be as much as \$1000 per procedure when using SU ancillaries in total knee replacement [25,26]. These results must be put into perspective in view of the American health model where the costs per procedure are much higher than in France. One of the interest of SU ancillary is for interim healthcare professionals who do not enough know the ancillary used in the operative room. SU ancillary has also a great interest in case of unavailable reusable ancillary (sterilization failure, missing ancillary and so on).

We did not include the cost of hospitalisation in the primary endpoint. In the period following the COVID pandemic, the low availability of rehabilitation centres considerably lengthened hospitalisation for patients irrespective of the equipment used in surgery. This item was counted only in the overall societal cost. We also didn't include the cost of hospitalisation for the complications.

The results we obtained were also slightly underestimated because the expense of the logistical management of the SU ancillaries (cost of ordering, technician time, storage time, cost of storage) was not counted. One of the constraints of using SU ancillaries is the need for greater storage volume for sterile device and less for ancillaries.

The claim that SU ancillaries significantly increase environmental impact is misleading. In this trial, we demonstrated a theoretical saving of 590 litres of water per procedure and 50 kW of electric power. Several other trials support these results in terms of environmental impact. However, we did not count the environmental impact of manufacturing the SU ancillary equipment, only its cost.

Concerning sterilisation, the study by Mont et al. [27] showed a net reduction of 32–57% in bacterial contamination by using SU cutting guides in total knee replacements. This was not confirmed in our case, where the only infectious complication recorded occurred in the SU arm. One of the limitations of our work that may explain this result is the small number of patients included.

Trials of single-use and patient-specific ancillaries consistently conclude that the number of trays to be sterilised is significantly lower than for conventional reusable instruments [27]. This conclusion was confirmed here: the number of boxes of ancillary equipment to be sterilised was on average halved in the SU arm.

We found that using these SU ancillaries had advantages in terms of time saved in handling, and optimised reaming quality by using new equipment for each procedure. Similar clinical trials have been conducted in urological surgery and showed a saving of 15–30% per procedure when using an SU urethroscope [28]. As regards the environment, the use of SU equipment permits a significant reduction in the amounts of water and electric power used, and a non-significant increase in the amount of waste produced.

For manufacturers, the total calculated average saving is much greater, as the use of conventional ancillary instruments requires renewal of the most fragile parts and regular factory upgrading. The development of SU equipment is a new business model whose

potential long-term advantages need to be carefully estimated. This marketing strategy is riskier than conventional management of ancillaries but may prove profitable in the long term.

There is probably a threshold effect with variable cost-effectiveness depending on the number of implants fitted per year, but we did not investigate it here. The staff of our study is limited, the operators were all experienced seniors. For the surgical technique, it is sometimes useful to start the reaming vertically with a smaller diameter reamer, in the case of a particularly sclerotic posterior wall, to avoid anterior slippage of the reamer, before verticalizing with the final reamer in good positioning. It is not possible with single use ancillaries. Two other limitations of our trial must be considered. First, the visual distinction between SU and conventional reusable ancillaries made a blind study impossible. Surgeons and staff were familiar with both types of equipment, so this could have introduced monitoring and measurement bias. However, most of the assessment criteria listed were objective (apart from operator satisfaction). The follow-up of our study was also short (3 months). Longer follow-up would be useful to verify the stability of the functional and radiological results obtained over time. Finally, we are not comparing exactly the same technique. It would be useful to complete the study on the optimization (lightening) of the contents of ancillary boxes (optimization of reusable)/versus single use, by setting up an environmental analysis of the different techniques.

5. Conclusion

Improving operational efficiency inside and outside the operating room and reducing cost dissipation are critical initiatives for many healthcare providers. SU ancillaries significantly reduce the table set up time and have the potential to facilitate time and cost savings but further research is needed in this direction. Our study shows that the daily workload, operating times, and the number of boxes of instruments to be sterilised are decreased. The associated environmental gain is significant. Nevertheless, the economic promise of these SU ancillaries is only partially supported in this trial owing to the small number of patients. Further work will be needed to obtain a more powerful medico-economic assessment of this promising ancillary product.

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Author contribution: RE took the lead in writing the manuscript, participated in research conception and correction. All authors provided critical feedback and helped shape the research, analysis and manuscript. RE and NB designed the model and analysed the data. AM did statistical analysis. CM did medico economic research. SD, SB and GV participated in research conception and correction

Declaration of Generative AI and AI-assisted technologies in the writing process: Authors confirm they did not used AI tool.

FIGURE LEGENDS

Figure 1. *Reusable ancillaries, cup, acetabular reamers*

Figure 2. *Quattro™ cup SU ancillaries*

Figure 3. *Quattro™ HAP Press Fit cup and Quattro® HAP VPS cup*

Figure 4. *Flow chart*

Figure 5. *Comparison of times for use and sterilisation of SU and RU ancillaries*

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	Pre-op	Surgery	M3	Assessor
Clinical assessment	X		X	Surgeon
Radiological assessment	X		X	Surgeon
Functional scores	X		X	Surgeon and patient
Pain (VAS)	X		X	Patient
Surgeon satisfaction		X		Surgeon
Complications		X	X	Surgeon

Table 1. Secondary endpoints assessed during the study

Table 2. Characteristics of the population

	Single Use	Re Usable	Total	<i>p</i> *
Male	6 (31.6%)	10 (47.62%)	16 (40%)	0.197
Mean age	80.7 ± 6.3	77.5 ± 8.2	79.0 ± 7.4	0.180
Body Mass Index	25.5 ± 4.3	26.4 ± 5.5	26.0 ± 4.9	0.153
Visual Analogic Scale	7.3 ± 1.4	5.9 ± 1.6	6.5 ± 1.7	0.007
pre-op				
Side				0.197
Right	10 (50%)	14 (70%)	24 (60%)	
Left	10 (50%)	6 (30%)	16 (40%)	
Harris score [18] (3	39.2 ± 9.6	40.9 ± 14.6	40.0 ± 12.3	0.662
month follow-up)	12.1 ± 2.2	12.4 ± 1.9	12.3 ± 2.0	0.336
Pain	16.3 ± 7.0	17.1 ± 9.5	16.7 ± 8.3	0.771
Mobility	6.9 ± 1.8	7.6 ± 3.0	7.3 ± 2.5	0.413
Activity				
WOMAC score [20] (3	65.5 ± 18.6	67.5 ± 20.9	66.6 ± 19.6	0.746
month follow-up)	4.1 ± 1.8	5.1 ± 2.0	4.65 ± 1.9	0.096
Symptoms	4.5 ± 2.0	5.2 ± 1.4	4.9 ± 1.7	0.237
Stiffness	20.2 ± 6.9	20.8 ± 8.3	20.5 ± 8.3	0.807

Pain	36.6 ± 11.4	36.4 ± 12.1	36.5 ± 11.7	0.947
Function				
HOOS score [21] (3	96.8 ± 23.9	95.6 ± 27.5	96.2 ± 25.6	0.882
month follow-up)	5.0 ± 2.3	5.7 ± 2.6	5.4 ± 2.5	0.443
Symptoms	4.4 ± 2.2	4.9 ± 1.8	4.65 ± 2.0	0.396
Stiffness	22.4 ± 6.3	21.5 ± 6.7	22.0 ± 6.5	0.632
Pain	40.3 ± 10.4	37.5 ± 13.9	38.8 ± 12.3	0.489
Function	12.5 ± 4.1	13.2 ± 3.6	12.9 ± 3.8	0.590
Activity	12.2 ± 4.5	12.9 ± 2.6	12.5 ± 3.6	0.550
Quality of life				
Devane score [20] (3				0.660
month follow-up)	3 (15.8%)	5 (23.8%)	8 (20%)	
1	11 (57.9%)	9 (42.8%)	20 (50%)	
2	5 (26.3%)	6 (28.6%)	11 (27.5%)	
3	0 (0%)	1 (4.8%)	1 (2.5%)	
4				
Charnley score [19] (3				0.482
month follow-up)	11 (57.9%)	6 (28.57%)	17 (42.5%)	
A	6 (31.58%)	11 (52.38%)	17 (42.5%)	
B	2 (10.5%)	4 (19.05%)	6 (15.0%)	
C				
PMA score [17] (3	10.1 ± 1.6	9.5 ± 2.3	9.8 ± 2.0	0.349
month follow-up)				

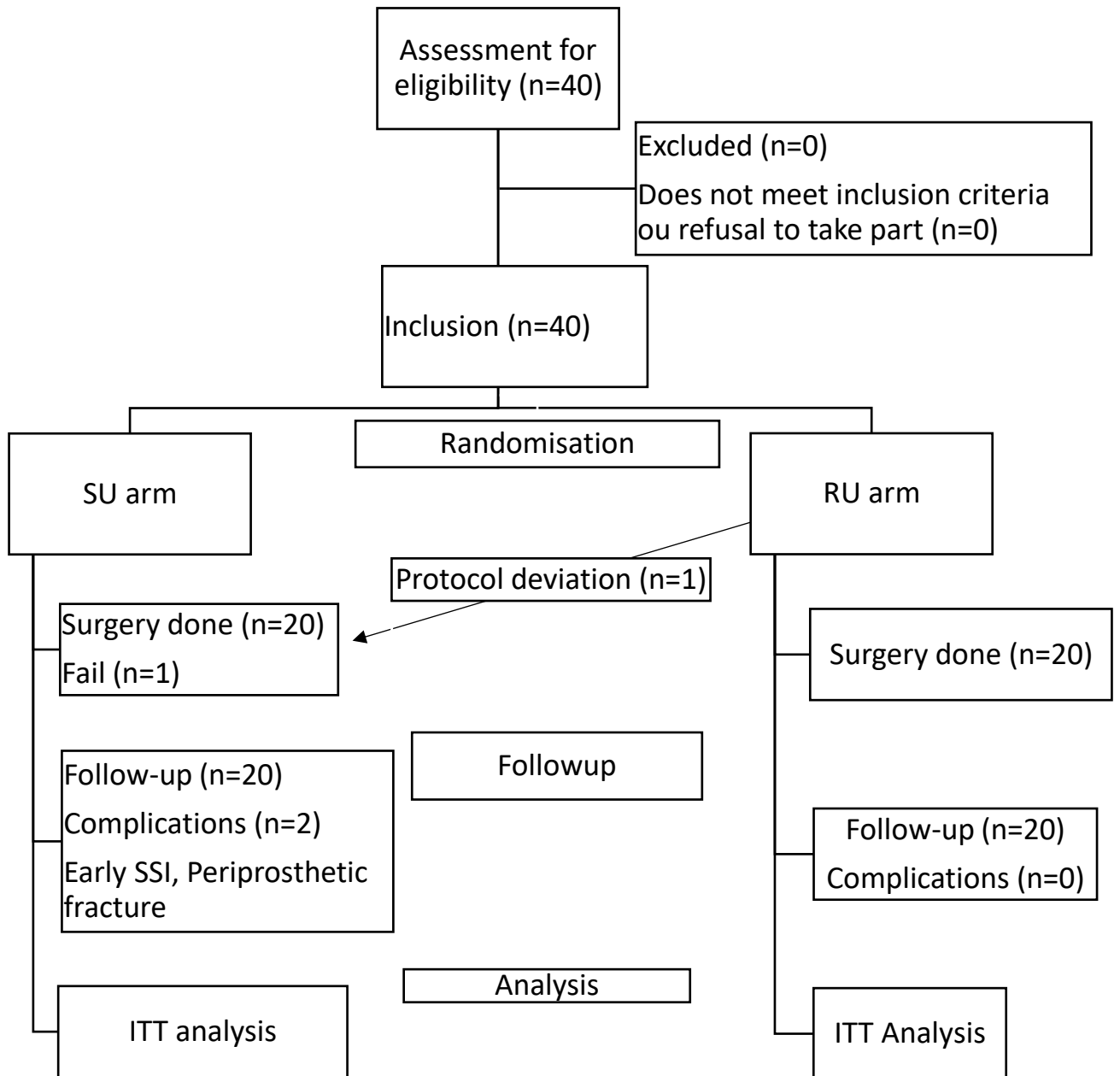
*PMA: Postel Merle d'Aubigné score, * p value in bold characters indicate significant differences*

Table 3. Radiographic analysis of Total Hip Arthroplasties

	Single Use	Re Usable	Total	<i>p</i>
Cup inclination (°)	41.1 ± 6.1	39.9 ± 8.4	40.4 ± 7.3	0.605
Acetabular offset variation (mm)	-2.8 ± 3.7	-0.2 ± 7.2	-1.4 ± 5.9	0.182
Femoral offset variation (mm)	-0.5 ± 4.6	-0.1 ± 4.9	-0.3 ± 4.7	0.809
Variation in height of centre of rotation (mm)	0.3 ± 4.3	0.8 ± 4.7	0.5 ± 4.5	0.702

°: degrees, mm: millimetre

Figure 4.



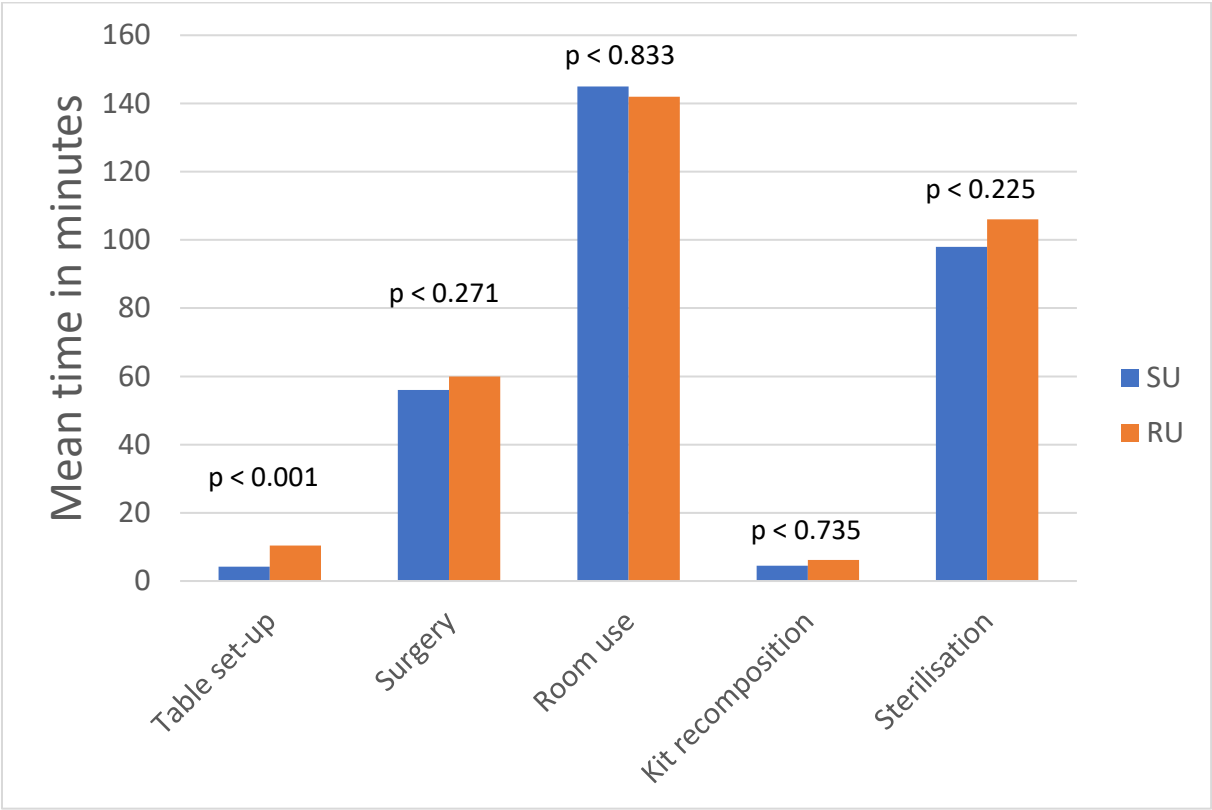


Figure 5.