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Mortality Analysis of Hip Arthroplasty Patients at a Tertiary Care Centre

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Background & Rationale
As the prevalence of hip and knee osteoarthritis increases with age, orthopaedic surgery has become widely prevalent among elderly individuals. Most Total Hip Replacements [THRs] (>two-thirds) are performed in elderly patients (>65 years old) which happens to be a population with frequent comorbidities [1]. Total hip replacement causes a short-term increase in the risk of mortality.

Mantilla CB conducted a study to assess the complication rates associated with primary total hip or knee arthroplasty and reported the following complications: myocardial infarction (MI) (2.2%), pulmonary embolism (PE) (0.7%), deep venous thrombosis (DVT) (1.5%), and the devastating complication of death (0.5%) [2].

Among patients undergoing surgery for hip fractures, the reported all-cause 30 day mortality ranges from 2.5% to 8% and 1 yr mortality is greater than 25%[3]. A study by Costain DJ et al reported the 30 day and 1 yr mortality to be 7% and 21% respectively in patients who underwent hemiarthroplasty [4]. Contrary to expectations, cardiovascular complications appear to have overtaken fatal pulmonary emboli as the leading cause of death after hip replacement [5].

There is a dearth in the availability of such data in our country. Mortality data is neither systematically collected nor published. This study was a systematic effort to calculate Immediate post-op, short term and long term mortality in THR and bipolar hemiarthroplasty (cemented and uncemented) at a tertiary care centre. When available, the additional data that has been generated would aid surgeons in determining the best method of THA or hemiarthroplasty among different groups of patients. Also a comprehensive evaluation of the mortalities would enable to improve the quality of post-operative care and help in the reduction of mortality rates.

Aims
We sought to calculate the following mortality rates after hip arthroplasty at a single tertiary care centre:
1. Immediate post-op (upto 48 hours)
2. Short-term (up to 30 days post-op)
3. Long-term (upto 1 year post-op)

Furthermore, we pursued to identify the timing of fatal or near fatal events.

Material & Methods
The study was initiated after obtaining approval from the Institutional Ethics Committee of the study site.

Study design: This was a retrospective analysis of prospectively collected data
Study population: Patients undergoing elective total hip arthroplasty (cemented as well as uncemented) and bipolar hemiarthroplasty (cemented as well as uncemented) carried out in the Department of Orthopaedics at the study site were considered eligible for the study.
Study duration: The study was conducted for a period of 3 years from September 2016 to August 2019.
Sample size: Records of 286 patients were evaluated in the study

Study Selection Criteria
Inclusion Criteria
Patients of any age or gender who were operated for hip arthroplasty were involved in the study.

Exclusion Criteria
Patients with pre-existing thrombo-embolic disorder. Any post-operative death occurring within 48 hours of operation was evaluated in detail and the EXACT cause of death according to post mortem report was monitored. All patients were followed up

at 1-year interval post-surgery.

Results

The analysis of the prospectively-collected data on 286 consecutive patients who had a hip replacement from September 2016 to August 2018 was done. Data was comprehensive and precise for peri-operative and 1 year mortality for all patients.

Table 1: Different demographic characteristics and indications for surgery

Characteristic	Value
Mean Age	55.43 ± 17.72 years
Male: Female	55:45
Indications for surgery	TCNF (41%) AVN Hip (28%) IT# (17%) Arthritis (14%)
Traumatic: Non Traumatic	67:33 %
ASA GRADE	1: 52% 2: 42% 3: 6%

In the present study, the mean age of our study patients was 55.43 ± 17.72 years. Of the 286 patients enrolled in our study, 55% were males, and 45% were females. In our study, most common indication for hip arthroplasty was Trans Cervical neck femur fractures(41%) while the other causes were avascular necrosis (AVN) of the hip(28%), Intertrochanteric femur fracture(17%) and hip arthritis(14%).In our study 67% people were operated for traumatic indications and the remaining 33% for non-traumatic indications. (Table 1) While it is difficult to establish causal relationships from our data, it is reasonable that traumatic cases do present with less time for optimization of medical problems.

Among our 286 patients, 52% were identified with ASA grade 1, 42% with ASA grade 2 and 6% with ASA grade 3. In the present study, majority, i.e. 94% patients did not have a significant history of any major cardiac/respiratory disease, as compared to only 6% that reported a significant history.

In our study, 10% patients underwent cemented THA, 35% patients underwent uncemented THA, 40% patients underwent cemented bipolar hemiarthroplasty and 15% patients underwent uncemented bipolar hemiarthroplasty. (Figure 1)

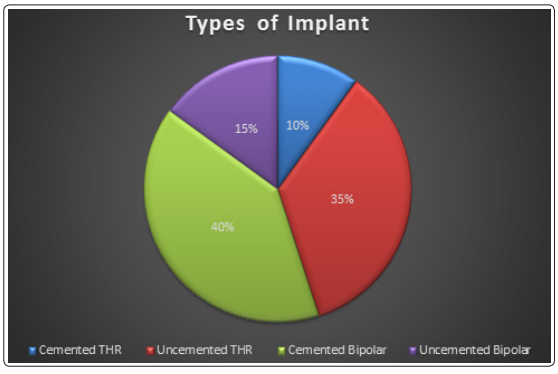

Figure 1: Types of implants and fixation used (cemented or uncemented THR or Bipolar)

During our study there was the death of 17 patients post operatively. All the deaths were studied in detail and the following observations were made.

Table 2: Mortality rates at various time periods

Time Period	Mortality Rates
48 hours	5.9%
30 day	8.5%
1 year	18.7%

Mortality rates in our study at 48 hours post op was - 5.9%, 30 day mortality – 8.5% & 1 year mortality rate was – 18.7%. NO intra operative deaths were noted in our study. With regard to death we obtained a follow-up of 100% at 1 year.

Out of 17 deaths – 12 were of traumatic etiology and 5 were non traumatic in etiology. Further among traumatic 10 were transcervical neck of femur fracture and 2 was inter trochanteric femur #. 5 non traumatic deaths included 4 avascular necrosis and 1 hip arthritis due to RA. Out of 17, 11 deaths were due to cardiovascular causes and 6 were due to non – CVS causes like Respiratory acidosis, Aspiration pneumonia, Cement embolism or Diabetic keto-acidosis.

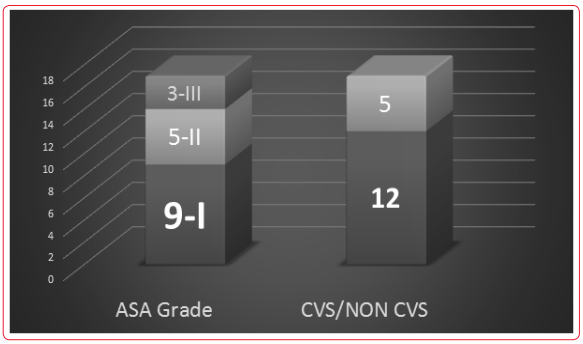

Figure 2: Detailed evaluation of post operative mortalities

There were 9 deaths (out of 17 deaths-52.94%) in cemented hip arthroplasties out of 145 total cemented hips(6.2%) & 8 deaths(out of 17 deaths-47.05%) among 141 uncemented hip arthroplasties (5.67%).

The Spearman's correlation coefficient (r) was used to assess the association between mortality and various parameters.

Table 3: Association between mortality and various factors

Factors	% (n=17)	R	p-value
Diagnosis Hip arthritis (1/14) IT Femur fracture(2/17) TC Neck femur fracture(10/17)	07.14 07.14 85.71	-0.117	0.24636
ASA grade 1(5/14) 2(9/14) 3(3/14)	 28.57 57.14 14.28	0.31106	0.00163
Surgery Cemented bipolar(9/14) Uncemented bipolar(5/14) Uncemented THA(2/14) Cemented THA(1/14)	 50 35.72 7.14 7.14	-0.17622	0.07947
Calculated using Spearman's correlation coefficient (r), P-value <0.05 considered statistically significant			

Table 4: Association between Mortality & various parameters

Significant	Non significant
• Traumatic	• Cemented or Uncemented
• ASA grade ≥2	

There was a statistically significant association of diagnosis (p=0.00241) especially traumatic etiology with mortality. There was no statistically significant association (0.07947) of the type of surgery (whether cemented or uncemented) with mortality. The chi-square test was used to compare the association between the type of surgery and death and revealed no statistically significant difference (p=0.24941). A statistically significant association (p=0.00163) was observed between ASA grade 2 and mortality.

The debate regarding superiority of cemented versus uncemented techniques remains unresolved since both their introduction. Scientific evaluation of published world literature reveals no difference. Systematic reviews & meta-analysis by pioneers in arthroplasty like Morshed, Abdul Karim, Olsen F, Costain DJ, Ning GZ, reveal selection of implant whether cemented or uncemented did not make a difference in the eventual mortality of patients[6,7].

Discussion

During our study there was the death of 17 patients post operatively. Mortality rates in our study at 48 hours post op was - 5.9%, 30 day mortality – 8.5% & 1 year mortality rate was – 18.7%. NO intra operative deaths were noted in our study.

Out of 17 deaths – 12 were of traumatic etiology and 5 were non traumatic in etiology. Further among traumatic 10 were transcervical neck of femur fracture and 2 were inter trochanteric femur #. 5 non traumatic deaths included 4 avascular necrosis and 1 hip arthritis due to RA. Out of 17, 11 deaths were due to cardiovascular causes and 6 were due to non – CVS causes like Respiratory acidosis, Aspiration pneumonia, Cement embolism or Diabetic keto-acidosis.

There were 9 deaths (out of 17 deaths-52.94%) in cemented hip arthroplasties out of 145 total cemented hips(6.2%) & 8 deaths(out of 17 deaths-47.05%) among 141 uncemented hip arthroplasties (5.67%). There was a statistically significant association of diagnosis (p=0.00241) especially traumatic etiology with mortality. There was no statistically significant association (0.07947) of the type of surgery (whether cemented or uncemented) with mortality. The chi-square test was used to compare the association between the type of surgery and death and revealed no statistically significant difference (p=0.24941). A statistically significant association (p=0.00163) was observed between ASA grade 2 and mortality.

Olsen F et al, in a retrospective study of patients who underwent cemented hemiarthroplasty reported the incidence of BCIS grade 1, 2, and 3 to be 21%, 5.1%, and 1.7% respectively. The mortality rate was 9% at 30 days and 29% after 1 yr. Of those who died within the first 48 hours, 95% were grade 2 or 3. The reported predictors for severe BCIS were ASA grade III—IV, chronic obstructive pulmonary disease, and use of diuretics or warfarin. A study from Norway found the incidence of intraoperative cardiovascular collapse or death in grade 3 BCIS patients to be 0.5% [8,9].

A few meta-analyses have reported no difference between cemented & uncemented techniques. A meta-analysis of 12 studies by Ning GZ et al, found no significant difference in mortality, hospital stay, blood loss, operation time, residual pain, and complication rate between those treated with cemented and uncemented hemiarthroplasty [6].

Another systematic review and meta-analysis of RCTs comparing cemented and uncemented THRs, reported no significant difference in the Harris hip functional score, radiological osteolysis, mortality and complications [7].

It has been revealed by our study that our overall death rate (5.5%) at 48 hours is low and compares favourably with 1 year mortality rates cited in the world literature (7% to 9%). Also our 1 year mortality rate (19%) is lower as compared to world literature (25-30%).

However, the limitations of the study must be recognised. Our study included relatively small numbers of patients, and we feel that this area is worthy of further study. Since mortality after total hip replacement operations is low many patients are needed to obtain statistically significant effects. Treatment allocation was not randomised and may have introduced a bias which we have been unable to measure. A prospective randomised study would be an ideal way to compare the efficacy of management modalities of BCIS. However, instituting such a study, may not be ethical.

Post op deaths remain an enigma and result in innumerable sleepless nights for the surgeon & patient alike. The alarmingly high mortality rates post hip arthroplasty strongly indicate that the prevention and treatment of thromboembolic events should play a central role when targeting to reduce or eliminate avoidable deaths following hip replacements.

Age remains an independent risk factor for mortality even after adjustments for comorbidity burden and other variables have been made. Appropriate attention to the care of elderly and comorbid patients would help to achieve a larger drop in mortality.

This study provides good baseline estimates on mortality for future studies. Our data can be utilised to evaluate the risk for perioperative mortality and to create targeted intervention to decrease the risk. Our data can be used in order to inform surgeons and their patients of the risk of mortality surrounding these surgical procedures and integrated in the consent process. In patients with numerous risk factors for mortality a discussion of risks and benefits seems sensible.

It is unrealistic to expect to completely eradicate post-operative mortality, particularly in an elderly population. But as healthcare providers it is our responsibility to strive for minimization of risk.

Conclusion

The findings from the present study highlight the importance of considering following factors to curb complications following hip arthroplasties.

1. All post-operative mortalities should be thoroughly evaluated including the post-mortem reports for the cause of death in order to learn the lessons so that they are not repeated in the future.
2. Selection of implant whether cemented or uncemented did not make a difference in the eventual mortality of patients.
3. For a post-operative period of 48 hours intensive monitoring of patients in an adequate setup should be done especially for the high-risk ones.

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