Cost Comparison of Cementless Versus Cemented Hemiarthroplasty for Displaced Femoral Neck Fractures

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Abstract

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Hip hemiarthroplasties are frequently performed for displaced femoral neck fractures. The purpose of this study was to identify the costs associated with cementless and cemented hemiarthroplasties, compare operative times, and identify complications. The hypothesis was that cementless hemiarthroplasties cost less than cemented hemiarthroplasties, require less operative time, and have fewer perioperative complications. A retrospective review was conducted of 2 surgeons’ patients admitted for displaced femoral neck fractures between 2006 and 2010. Group 1 included 45 patients who underwent monopolar hemiarthroplasties with cementless femoral components via a standard posterior approach by a single surgeon. Group 2 included 49 patients who underwent monopolar hemiarthroplasties with cemented femoral components via a modified lateral approach by a single surgeon. Surgical and anesthesia times and the cost of implants and accessories were recorded. The cost for cementless components was $3275.60 (femoral stem, $2800; monopolar head, $400; sleeve, $75.60), whereas the cost of cemented components was $3694.47 (femoral stem, $1800; monopolar head, $400; sleeve, $75.60, 3 Simplex with tobramycin cement packets, $1221; cement mixer/irrigator with tip/centralizer and plug/pressurizer, $197.87), a cost savings of 12.7% ($418.87). Operative time was significantly reduced in group 1 vs group 2 (mean, 32.9 vs 56.1 minutes, respectively; P<.01). Anesthesia time was also significantly reduced in group 1 (mean, 82.3 vs 102.9 minutes, respectively; P<.01). The difference in mean anesthetic times demonstrates an overall cost savings of 18.6%, or $1161.30. No difference in complications was noted between the groups perioperatively. Regional cost variances, vendor–hospital contracts, and surgeons’ operative times are factors that may influence cost savings. This study demonstrates significantly lower operative and anesthetic times and observable cost savings with cementless femoral implants.

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Drs Tripuraneni, Carothers, Junick, and Archibeck have no relevant financial relationships to disclose.

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The incidence of displaced femoral neck fractures varies by country, with the highest rate occurring in the United States and European countries. In the United States, the incidence of intra- and extracapsular proximal femur fractures ranges from 250,000 to 300,000 cases per year, of which one-third undergo an arthroplasty procedure. This translates into a significant economic burden for the health care system. In 2009, the Agency for Healthcare Research and Quality estimated that $4.4 billion was used for the care of femoral neck fractures alone. Common surgical interventions for femoral neck fractures include internal fixation, hemiarthroplasty, and total hip arthroplasty.

Cemented hemiarthroplasties are well studied and demonstrate good, predictable outcomes. Many authors have questioned the adverse effects associated with bone cement in elderly patients and have explored cementless hip hemiarthroplasties as an alternative. Promising data exist regarding the use of cementless components in elderly patients with poor bone quality. Minimal data exist on cementless hemiarthroplasties for displaced femoral neck fractures. A few studies have demonstrated shorter operative times, overall lower mortality rate, and less intraoperative blood loss. Higher revision rates and lower functional scores with cementless stems have been reported. To the current authors’ knowledge, one cementless stem has been reported.

The purpose of this study was to identify the costs associated with cementless and cemented hemiarthroplasties, compare operative times, and identify complications. The hypothesis consisted of 3 parts: cementless hemiarthroplasties (1) cost less than cemented hemiarthroplasties, (2) require less operative time, and (3) have fewer perioperative complications.

Materials and Methods

Between January 1, 2006, and December 31, 2010, displaced femoral neck fractures treated by 2 surgeons were reviewed. One surgeon (D.J.W.) performed cementless hemiarthroplasties (group 1), and the other surgeon (M.J.A.) performed cemented hemiarthroplasties (group 2). No patient crossed into another group or treatment method. Only patients with a minimum of 2-year follow-up were included in this study. These patients were identified within the authors’ institution’s billing program, after a search conducted for current procedural terminology (CPT) code 27236 (fracture of the proximal end of the femur treated with endoprosthesis). Institutional review board approval was obtained for this retrospective study.

Inclusion criteria were displaced femoral neck fractures treated with hemiarthroplasty. These fractures were clinically evaluated by their respective attending surgeon on presentation to the emergency department, and only those fit for a hip hemiarthroplasty were included in this study. Patients treated with total hip arthroplasty or internal fixation were excluded.

All procedures in group 1 were performed through a standard posterolateral hip approach. All procedures in group 2 were performed through a modified direct lateral approach. Operative time and anesthesia time were recorded based on anesthesia records, and intra- and postoperative complications were recorded using the medical records. Itemized costs of each component required for cemented and cementless hemiarthroplasties were recorded based on hospital data. Anesthesia cost was also recorded through direct communication with the operating room purchasing manager. No patient received a bipolar head; all were monopolar.

Statistical analysis was performed based on continuous variables with a Student’s t test using Microsoft Excel (Redmond, Washington).

Results

After a search for CPT code 27236, group 1 comprised 183 patients and group 2 comprised 145 patients. Once inclusion and exclusion criteria were applied, 45 patients remained in group 1 and 49 in group 2. All patients received monopolar hemiarthroplasties. Average patient age was similar between the groups (group 1, 81.6 years; group 2, 81.7 years; P = .93). Average operative time was 32.9 minutes in group 1 and 56.1 minutes in group 2 (P < .01). Average anesthesia time was 82.4 minutes in group 1 and 102.9 minutes in group 2 (P < .01).

Complications in group 1 included 1 of each of the following: myocardial infarction, urinary retention, pneumonia, and cardiac arrhythmia. Complications in group 2 included 1 of each of the following: myocardial infarction, confusion, arrhythmia, nonspecific ST electrocardiography changes, acute renal failure, and pneumonia. Neither group experienced a deep venous thrombosis or pulmonary embolism. All patients received deep venous thrombosis chemoprophylaxis with low-molecular-weight heparin or coumadin.

All cementless stems were VerSys LD/Fx (Zimmer, Warsaw, Indiana); cemented stems were 38 VerSys Heritage stems and 4 VerSys Advocate stems (Zimmer). All patients were permitted to bear weight on the operative limb as tolerated; no restrictions were placed other than standard dislocation precautions based on approach.

No surgical complications occurred immediately postoperatively or at a minimum follow-up of 2 years. No periprosthetic fractures or dislocations occurred in either group.

Itemized costs for cementless and cemented stems are detailed in the Table. The difference between the 2 techniques results in a combined cost savings of $418.87 (12.7%) in favor of cementless femoral stems. Anesthesia cost per minute to the hospital is $36.04; applying this rate to the respective average anesthesia times per group yields an average anesthesia cost of $2966.09 per case for group 1 and $3708.52 for group 2. This is a difference of $742.43 (25%).

A combined savings for implant and anesthesia costs equals $1161.30 (18.6%).
**Table**

<table>
<thead>
<tr>
<th>Component</th>
<th>Group 1</th>
<th>Group 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Femoral stem</td>
<td>2800</td>
<td>1800</td>
</tr>
<tr>
<td>Monopolar head</td>
<td>400</td>
<td>400</td>
</tr>
<tr>
<td>Sleeve</td>
<td>75.60</td>
<td>75.60</td>
</tr>
<tr>
<td>Cement</td>
<td>N/A</td>
<td>1221</td>
</tr>
<tr>
<td>Cement accessoriesd</td>
<td>N/A</td>
<td>197.87</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>3275.60</td>
<td>3694.47</td>
</tr>
</tbody>
</table>

*Abbreviation: N/A, not applicable.  
*aCementless hemiarthroplasty.  
*bCemented hemiarthroplasty.  
*c3 packets.  
*dMixer, brush, and curette set.*

**DISCUSSION**

Cemented hip hemiarthroplasties for displaced femoral neck fractures have long been considered the standard of care in elderly patients. Excellent long-term functional and pain scores have been well documented with this procedure, including Australian and Italian national registries.14,15 With earlier designs of cementless femoral stems, pain scores were higher and the need for ambulatory assist devices was greater when compared with cemented stems.1,7,16 Modern cementless femoral stems have been successful in total hip arthroplasty, even in Dorr C type femoral bone quality.9,10 This has renewed interest in cementless hemiarthroplasties, especially with a theoretically appealing side effect profile, that has not been borne out in the literature. The current study examined the complications associated with both types of femoral stems while adding the aspect of cost savings to the potential benefits. To the authors’ knowledge, no other study has examined the costs associated with hemiarthroplasties.

Although this study showed no difference in complications between the 2 groups, the complications that occurred, at an almost equal rate, should not be ignored. Both types of femoral stems are safe.17 This study compared operative and anesthesia times between groups and noted shorter times in the cementless group. This may vary based on the surgeon; however, other studies have also demonstrated similar results.1,18-20

Society has become increasingly cost conscious, especially with medical care. For the single practice studied here, a notable difference in anesthesia and implant cost savings was found, favoring cementless over cemented hemiarthroplasty. The demonstrable 18% savings could potentially translate into reallocation of additional resources or increased hospital or physician reimbursement, especially with bundled payments looming in the future.

This study had limitations. First, it was retrospective and had a small sample size. A power analysis was not performed, introducing the possibility of beta error. The main purpose of the study was comparing costs. Second, costs are variable among institutions and on a per annum basis within an institution. This study captured costs at a specific time and did not account for changes over the 5-year time frame studied. Regional variances may preclude cementless stems from being cost effective in some locations. Vendor–hospital contracts are different at every hospital. Each surgeon’s operative time is also a variable that cannot be predicted to carry over to create an 18% cost savings. Contradicting the current study, another study noted increased costs for cementless stems at 3 major academic centers.21 This demonstrates the ever-changing health care environment and variables based on location alone. Third, functional outcomes or pain scores with objective data were not studied. Because this was not an objective of this study, it was intentionally excluded from the study. Finally, this study’s 2 groups had numerous variables; each group had a different surgeon with a different surgical approach to the hip. This contributed to differences in outcomes, which were not quantified or examined.

This was a smaller study performed in a community setting. Larger organizations and hospital systems may command lower contractual rates. However, a large volume of arthroplasty cases are performed at this institution. Regardless of the surgeon’s experience, comfort, or preference, a cemented femoral component requires additional time for canal preparation and polymerization of cement, which will always increase operative and anesthesia time.

**REFERENCES**


