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Girdlestone Procedure: A Viable Alternative for Displaced Femoral Neck Fractures

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Abstract

Background: The Girdlestone procedure (femoral head ostectomy) is a salvage operation that may be used for treatment of infected hip arthroplasty in non-ambulatory patients or those unable to tolerate a two-stage surgery. Infection control is well-established and generally pain is tolerable. The purpose of this study was to evaluate surgical risk associated with Girdlestone procedure as a suitable alternative treatment of displaced femoral neck fracture in very highly-comorbid patients at high-risk for tolerating hemiarthroplasty.

Methods: A retrospective chart review of 30 non-ambulatory patients over 10 years who underwent Girdlestone procedures for displaced femoral neck fractures due to extremely-high anesthetic and/or infection risk.

Results: Girdlestone procedures were reasonably well-tolerated in very high-risk surgical candidates with displaced femoral neck fractures and required lower reoperation rates than closed reduction and percutaneous pinning. Perioperative, 90-day, and 1-year mortality rate were 3% (1/30), 53% (16/30), and 67% (20/30), respectively. Of patients who followed-up after surgery, 33% maintained their previous functional mobility and 66% reported improved mobility after their Girdlestone procedure.

Conclusion: Girdlestone procedures serve as a well-tolerated alternative procedure for displaced femoral neck fractures and should be considered when treating a patient who is non-ambulatory.

Keywords: Femoral neck fracture; Girdlestone; Hip arthroplasty

Introduction

Hip fractures are among the most common orthopedic injuries suffered by the elderly population. It is globally estimated that hip fractures will affect approximately 18% of women and 6% of men. Patients with displaced femoral neck fractures that are extremely high surgical risk pose a difficult problem for orthopedic surgeons, with treatments typically involving hemiarthroplasty. Geriatric patients presenting with hip fractures often carry significant comorbidities including disability, depression and cardiovascular disease, making management challenging [1].

Patients who sustain a hip fracture experience not only a significant health, but financial burden as well. It is estimated that each hip fracture is associated with a $30,000 healthcare cost and that number only increases with age [2]. Surgery within 24 hours is generally advised for improved health and economic outcomes in these patients [3]. Due to the tenuous blood supply of the femoral head and subsequent risk for osteonecrosis, treatment is generally determined by patient factors, the location of the fracture, and its configuration [4]. A displaced fracture in the elderly is often managed with arthroplasty, either total hip arthroplasty or hemiarthroplasty depending on the patient's baseline mobility and age. Total hip arthroplasty is reserved for patients with a higher demand lifestyles, while a hemiarthroplasty is done for less active and/or less mobile patients at baseline [5].

Nonsurgical management is always an option; however this comes with extremely high amounts of pain for the patient and increased mortality [6]. Closed reduction with percutaneous pinning may be attempted, however reoperation rates of this procedure has been reported to be up to 35% revision rendering this unacceptable treatment for a displaced femoral neck fracture [7]. Hemiarthroplasty typically functions as the best treatment for hip fractures due to low revision rates but a longer procedure associated with higher blood loss and higher subsequent infection risk.

A less common option, for completely non-ambulatory or high infection risk patients, whose primary goals are pain control and avoidance of subsequent surgeries is a Girdlestone procedure (femoral head ostectomy). While a Girdlestone procedure is invasive, it has the benefit of no hardware and therefore a low infection risk. A Girdlestone procedure, or femoral head and neck ostectomy, has been traditionally used as a salvage procedure for infected hips and to alleviate joint contracture pain in cerebral palsy patients. This procedure is also indicated in elderly patients with failed internal fixation or patients who cannot tolerate hemiarthroplasty [8].

The purpose of this study was to report on mortality rates and complications of extremely high anesthetic and infection risk patients who underwent Girdlestone procedures for displaced femoral neck fractures over a 10-year period. It was hypothesized that Girdlestone procedures would serve as a well-tolerated procedure with low in-hospital mortality and reoperation rates.

Materials and Methods

Prior to the beginning of reviewing any data, institutional review board approval of the study was obtained. A list of procedures over a 10-year period was generated by searching a single hospital systems electronic medical record operating room log for the keyword “Girdlestone” generating a list of 60 patients. This patient list was vetted for Girdlestone procedures of the hip (humeral Girdlestone procedures were excluded) for the purpose of hip fracture with at least one year follow-up, resulting in a cohort of 30 patients that were included in the study. Inclusion criteria were primary Girdlestone procedure for displaced femoral neck in non-ambulatory patient or salvage Girdlestone procedure for minimally ambulatory or high-infection risk patients with failed internal hardware for previous hip fracture. Patients with less than 1-year follow-up and no publicly available name and birthdate matched death certificate were excluded from this study as mortality rates could not be confirmed.

Indications for Girdlestone procedure were documented. These included immobility, significant medical pathologies, and infection risk. Immobility was defined as “non-ambulatory” by family, or documented wheelchair use as primary mobility, or bed-bound. Surgical risk factors including: age at time of surgery, pre-operative immobility, abnormal EKG, dementia, ASA Physical Status score of 4, and male sex were recorded. Patients were followed for up to one year post-operatively.

Surgical complications were separated as minor and major complications. Major complications were defined as the following: in-hospital mortality, infection or hardware failure requiring return to the operating room, or major systemic illness. Minor complications were defined as all other documented complications including superficial surgical site infection, wound dehiscence, etc. Perioperative mortality (within post-op day 7), 90-day mortality, and 1-year mortality were recorded. Patient in-hospital mortality was determined from electronic medical record chart review, while 90-day and 1-year mortality rates were determined by review of publicly available death certificates matched by full name and birth-date. The Relative Risk (RR) and Confidence Interval (CI) of each surgical risk factor for non-fatal complication and mortality rates were calculated.

Results

30 femoral neck fractures treated with a Girdlestone procedure were analyzed. Five patients had non-displaced hip fractures (Garden classification type II) and 25 had displaced hip fractures (Garden classification type III and IV). Patients with Garden classification types I and II fractures had either chronic valgus impacted hip fracture with continued pain or previous hardware failure. Several patients were classified as Garden classification types I or II on AP radiographs, but demonstrated retroversion on lateral films. Age, sex, comorbidities, surgical indication, Garden class type, and case duration were noted. The cohort included 18 (60%) females and 12 (40%) males with a mean age of 80.2 (range 53-99).

The average duration of each Girdlestone procedure was 99.7 minutes (range 75-141) and the average length of stay in the hospital as 6.8 days (range 1-28) for each patient. Three patients (10%) were found to have major surgical complications. Two of these cases involved surgical site infections. Of these two, one required irrigation and debridement. The other major surgical complication included a perioperative in-hospital mortality secondary to myocardial infarction in one patient. One patient had a minor surgical complication. This included wound site dehiscence not requiring reoperation. Two of the three patients with non-fatal perioperative complications required reoperation.

Perioperative, 90-day, and 1-year mortality rate were 3% (1/30), 53% (16/30), and 67% (20/30), respectively (Table 1). The one patient that suffered perioperative mortality was found to likely have suffered a myocardial infarction (elevated troponin levels during resuscitation efforts).

Fracture type (Garden classification)	# Patients
I	0
II	5
III	6
IV	19
Surgical complications	# Patients
Site Infection	2
Peri-op complications	3
Re-op required	2
None	27
Follow-up metrics	# Patients

Abnormal EKG	8
Cognitive impairment	5
Immobility	5
N/A	16
Mortality	# Patients
Peri-op	1
90-day	15
1-year	4
N/A	10

Table 1: Analyzation by using Girdlestone procedure.

Secondarily, no surgical risk factors resulted in a statistically significant increase in relative risk for complication rate, perioperative, or 90-day mortality; however, the cohort was not powered to detect a difference. ASA physical status score of 4 was predictive of increased 1-year mortality rates (RR=1.5, CI=1.01-2.41). Surgical complications such as wound site infection, non-fatal perioperative complication and if reoperation was required are also included in Table 1 (Table 1).

Of the 30 patients that were a part of this study, 10 (33%) were documented as baseline immobile, defined as mobilization only with a wheelchair. 15 (50%) patients returned for follow-up appointments. Of these 15 follow-up patients, five patients (33%) maintained their previous level of function and ten (66%) reported improved functional mobility. In addition, after their Girdlestone procedure, cognitive impairment and abnormal EKG reading were documented in Table 1. An average ASA score of 3.1 was also noted for patients at their follow-up appointments (Table 1).

Discussion

While femoral neck fractures are relatively common in the geriatric population, any surgical intervention or anesthesia can pose a risk to patients, and any implanted hardware does risk infection. While arthroplasties have better functional outcomes, Girdlestone procedures maintain a unique role in minimizing reoperations and time spent in the operating room for very high-risk surgical candidates in which their functional outcome is not a major concern. Our data suggests that Girdlestone procedures provided a less painful outcome for non-ambulatory patients in comparison to nonsurgical management. Furthermore, our data suggested that patients with higher ASA scores showed similar return to functional baseline mobility and mortality rates with the Girdlestone procedure compared to a hip arthroplasty. Taking these findings together, it supports the hypothesis that a Girdlestone procedure is a viable alternative and should be considered in the geriatric population in patients where a hip arthroplasty may be contraindicated.

Girdlestone procedures present a more preferrable option than non-operative treatment for non-ambulatory hip fracture patients. The one-year mortality rate for non-operative treatment of a hip fracture for a geriatric patient (>65) is 84.4%. Our data showed a 67% one-year mortality rate for geriatric patients undergoing a Girdlestone procedure. One reason for the lower mortality rates for patients undergoing Girdlestone procedures could be the decreased length of stay in the hospital compared to patients undergoing non-operative treatment. Our data showed that patients stayed in the hospital for an average of 6.8 days after the Girdlestone procedure compared to an average of 22.4 days for patients undergoing non-operative treatment [9]. The increased length of stay in the hospital could play a role in patients being more sedentary which could subsequently lead to more cardiovascular sequelae and one-year mortality rates. Furthermore, a Girdlestone procedure should be considered for patients who are contraindicated for hip arthroplasty rather than non-operative treatment due to a lower one-year mortality rate.

Girdlestone procedures help minimize reoperation rates by eliminating implanted hardware that could fail or become infected. With no deep hardware there is minimal chance of a deep infection. Previously published studies suggest that aseptic reoperations within one year following primary total hip arthroplasty resulted in an 8- to 13-fold increase risk of subsequent periprosthetic joint infection [10]. Traditionally, resection arthroplasty of the hip has been utilized for chronic infections and has been demonstrated to definitively resolve chronic periprosthetic infections in 84% of patients [11]. Patients with particularly high infection risk such as those that are septic or bacteremic at time of injury should be considered for a Girdlestone procedure.

Our data showed that patients spent an average of 6.8 days in the hospital after a Girdlestone procedure. One plausible explanation for this finding is the low infection and complication rates and subsequently the short postoperative recovery time for Girdlestone procedures. In fact, there is data to support that postoperative hip infection predisposed patients to a prolonged length of stay in the acute unit and ultimately to a more dependent destination after discharge [12]. Therefore, it can be inferred that a Girdlestone procedure may minimize length of stay by eliminating possibility of hardware failure and minimizing risk of surgical site infections.

The present study demonstrated no significant change in mobility for patients prior to and after their Girdlestone procedure. Our data showed that 33% of patients were immobile before the procedure was performed and of the 15 patients that followed-up, 33% maintained their same functional immobility after the procedure was performed. The other 67% of patients that followed up reported improved functional mobility after their Girdlestone procedure. These findings were not unexpected as Girdlestone procedures focus on improving palliative outcomes rather than functional ones. Girdlestone procedures provide a viable option to arthroplasty with regards to pain relief and infection control at the cost of limited mobility [13]. Therefore, in patients who are contraindicated for hip arthroplasty procedures and those who have not responded well

to operative hip treatment in the past, Girdlestone procedures remain a functional alternative.

Limitations of this study include its inability to obtain a significant number of follow-up patient interviews after their Girdlestone procedure. Because of this, our study was unable to highlight the change in certain parameters such as mobility and cognitive impairment before and after their procedure. Additionally, our study was limited to only 30 patients due to the stringent inclusion criteria we placed on our patient population. These criteria included patients who were non-ambulatory, minimally ambulatory, or patients who had a high risk of infection due to failure of hardware from a prior operation. As such, this study may not be applicable to other elderly patients with hip fractures who do not meet the aforementioned criteria.

In conclusion, Girdlestone procedures is a viable procedure for elderly patients who are non- or minimally-ambulatory or at high infection risk with placement of hardware. Girdlestone procedures minimize infection risk and eliminate possibility for hardware failure. Moreover, Girdlestone procedures serve as a well-tolerated procedure with low in-hospital mortality and reoperation rates and should be considered when treating a patient who is non-ambulatory.

Conflicts of Interest

I declare on behalf of me and all my coworkers that we have no conflicts of interest.

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