Management and outcomes of the treatment of intra-capsular neck of femur fractures in young patients with a minimum of 5 years follow-up

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INTRODUCTION:

Intracapsular (IC) neck of femur (NOF) fractures represent a rare, yet significant injury in young patients, traditionally linked to high energy trauma. Significant complications such as avascular necrosis (AVN) and fracture non-union have been previously reported in as many as 25% and 30% of the patients respectively. Joint preservation is the cornerstone of management of high energy IC NOFs especially in younger patients. This involves prompt anatomical reduction and stable internal fixation of the femoral neck, in an attempt to salvage the femoral head.

The aim of our study was to evaluate the characteristics, outcomes and complications of patients younger than 50 years of age presenting to our institution with an IC NOF fracture, with a special reference to re-operation and need for Total Hip Arthroplasty (THA).

METHODS:

Over a nine-year period, all patients younger than 50 years of age presenting with an IC NOF fracture were eligible for inclusion. Exclusion criteria included patients having their operations in other institutions and patients who did not attend follow up. All patients were managed in the context of a multi-disciplinary trauma team setting and were operated on by experienced trauma surgeons. Implant selection was based on fracture configuration and surgeon's preference. Following fracture fixation, all patients were rehabilitated according to a standardised protocol, unless any other significant injuries were present. Check radiographs were taken 48 hours post-operatively and then in regular intervals until discharge from follow-up. Parameters collected and evaluated included patient demographics, mechanism of injury including Injury Severity Score (ISS), co-morbidities, type of implant, fracture classification (Garden and Pauwels classification), post-operative complications and radiographic evaluation. Multivariate logistic regression analysis was performed to identify independent factors associated with increased risk of complications including AVN, non-union, and revision surgery. The minimum follow-up was five years, unless a patient was deceased before this.

RESULTS:

A total of 105 patients (110 fractures) were included in the study. The mean age was 39.5 years (SD 8.44 years; Range: 19.9 - 50.7 years). Sixty-eight patients (64.8%) were male, 52 (47.3%) fractures involved the left side, one fracture (0.9%) was an open injury and 20 patients (19%) sustained associated injuries. Nine patients (8.7%) had an ISS score of 16 or more (Range: 9 - 41). Seventy-two patients (68.6%) had a Charlson Comorbidity Score (CCS) of 0, whilst 16 patients (15.2%) had a score of 2 or more (Range 0 - 3). Only 53 patients (50.4%) were classed as ASA 1. The commonest mechanism of injury involved a fall from standing height (n=55, 52.3%). A high energy mechanism was seen in 43 cases (40.1%). Thirty-five fractures were undisplaced (Garden I: 5; Garden II: 30) and 72 were displaced (Garden III: 43; Garden IV: 29). Three fractures were not classified as the initial radiographs were unavailable at the time of the analysis. Using Pauwels classification, 12 fractures were type I, 34 type II and 50 type III.

The mean time from admission to anaesthetic room was 14.5 hours (SD 22.6 hours, Range 0.73 - 158.3 hours). The post-operative median length of stay in days was 4.7 (IQR 2.8 – 9.0 days). Sixty procedures (54.5%) were performed by an Orthopaedic registrar / resident. The majority of the fractures were treated with cannulated hip screws (CHS; n=65, 59.1%). Twelve fractures (10.9%) were treated with a Dynamic Hip Screw (DHS) alone, whereas in 33 fractures (30%) a de-rotation screw was used along with the DHS. The mean tip-apex distance in the patients who received a DHS was 19.8mm (SD 6.4mm, Range: 10 – 34 mm).

Complications were reported in 43 fractures, including non-union in 18 (16.4%), avascular necrosis (AVN) in 24 (21.8%), screw cut-out in 10 (9.1%) and deep infection in one (0.9%).

The effects of multiple factors on risk of AVN, non-union and cut-outs were examined including age, gender, ASA, ISS and CCS, history of smoking and alcohol intake, fracture classification and type of fixation. No statistically significant

factors were identified to increase the risk of AVN. Male gender (p=0.04), smoking (p=0.05), alcohol consumption of >14 units weekly (p=0.021), increasing ASA and CCS (p<0.001) were found to be independently associated with increased risk of non-union. These were examined in a multiple logistic regression analysis model, and after adjusting for confounders, the only factor associated with increased risk of non-union was an increasing CCS (p=0.012, OR43.7, 95% CI: 2.3 – 829.9). Tip-apex distance was not associated with a statistically significant increase in the risk of screw cut-outs (p=0.305), nor the need to return to theatre for removal of metalwork (p=0.461).

A total of 29 patients (26.4%) underwent THA following failure of their fixation. Patients who suffered a collapse of the inferior screw following cannulated hip screw fixation were 3 times more likely to develop severe OA requiring THA (p=0.005, OR3.4, 95% CI: 1.5 - 7.9). Collapse of the superior screws had no effect on the probability of developing severe OA requiring THA (p=0.813, OR 0.9, 95% CI: 0.2 - 3.1). The overall all-cause mortality in the study was 17 patients (16.1%). An increasing CCS was associated with decreased long-term survival (p=0.012, Log-Rank).

DISCUSSION AND CONCLUSION:

This study demonstrates that the incidence of complications in IC NOF fractures in young patients remains high, with a significant number of these patients receiving THA because of the failure to preserve the femoral head. Smoking, male gender, alcohol consumption over 14 units weekly and increasing ASA are all associated with increased risk of non-union. A higher Charleston Comorbidity Score is associated with increased mortality and morbidity and as such should be used to inform patients and help decision making and informed patient consent.