Proximal humerus fractures in diabetic patients: surgery versus conservative management

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Introduction
Diabetes mellitus is an endocrine disorder causing a metabolic abnormality of persistent hyperglycaemia leading to abnormal glycosylation of proteins, fats causing neuro-musculoskeletal disorders characterized by abnormalities of nervous tissue, joint and bone. The rates of diabetes especially Type II is increasing in the developed world and its attendant complications, through local and systemic effects of hyperglycaemia upon the microvasculature and upon soft tissue healing and wound infection rates, should not be overlooked in humerus fracture treatment. In this study, we investigated the association between patients with Diabetes Mellitus sustaining proximal humerus fractures and the effect on fracture and soft tissue healing outcomes.

Materials and Methods
Out of 1752 patients, 98 patients (22 males and 76 females) met the inclusion criteria (closed fracture, and previously diagnosed with type 1 or 2 diabetes mellitus). 36 patients were of type 1 (mean age 51) and 62 were of type 2 (mean age 56). 12 patients underwent surgical fixation while the rest had conservative management.

An age and sex matched control group (n=98) were randomly identified to their Neer classifications and treatment requirements.

For the operative group, baseline serum glucose was documented at 4 time-points: pre-operative, immediate post-operative, late post-operative and 1st outpatient clinic follow-up (within 4 weeks of surgery).

Primary outcome factors studied were degree of glycaemic control in the operative group, time to fracture union and soft tissue healing.

Secondary outcome factors studied were postoperative complications, and the incidence of delayed union and non-union.

Radiological union required clear evidence of bridging callus and bony trabeculae traversing and obscuring the fracture line; while clinical union was a more subjective assessment of fracture stiffness. It is well known that these techniques have a number of limitations; however they may be linked to prolonged local pain. Patients with type I diabetes and poor peri-operative glycaemic control sustaining proximal humerus fractures are more likely to suffer from increase in time to union, delayed union and wound healing problems.

Results
In the operative group, DM I patients were more likely to suffer from poor glycaemic control postoperatively in terms of frequency (p=0.001) and severity of deviation from normal range (p=0.012), when compared to DM II patients. Further analysis showed significant difference in time to fracture union between DM I and DM II cohorts (mean 13 vs. 9 weeks, p<0.004) and DM I and control group (mean 13 vs. 8 weeks, p<0.003).

In the conservatively managed group, there was significant difference in time to fracture union between DM I and DM II cohorts (mean 13 vs. 9 weeks, p<0.003) and DM I and control group (mean 11 vs. 8 weeks, p<0.004). DM I patients were more likely to suffer delayed soft tissue healing (time to wound healing) when compared to DM II (p<0.021) and controls (p<0.029).

Discussion and Conclusion
Diabetes mellitus is known to cause significant macro- and microdamage to the peripheral vascular system. This is likely to affect both soft tissue and bone healing. The disturbance to the nerve physiology may be linked to prolonged local pain. Patients with type I diabetes and poor peri-operative glycaemic control sustaining proximal humerus fractures are more likely to suffer from increase in time to union, delayed union and wound healing problems.