PARTIAL POSTEROMEDIAL OLECRANON RESECTION - AN ATHLETE’S FRIEND AND FOE

*Kamineni, S; +*An, K; *Neale, P; *Hirahara, H; *Pomianowski, S; O'Driscoll, S; Morrey, B
++Biomechanics Laboratory, Mayo Clinic, Rochester, MN 55905. 507-538-1717, Fax: 507-284-5392, an.kainan@mayo.edu

Introduction
The posteromedial olecranon process is a site of bony abutment in throwing athletes which can result in the formation of painful posteromedial olecranon corner osteophytes. The standard form of treatment is by debridement, with the resection of osteophytes as well as varying amounts of normal olecranon. Little data are available concerning the biomechanical importance of the posterior olecranon and no literature exists concerning the effects of resecting different amounts of normal posteromedial olecranon. We hypothesized that greater amounts of resection would increasingly derange elbow kinematics and decrease its stability.

Methods
We investigated the kinematic effect of increasing torque and posteromedial olecranon resections, in twelve fresh-frozen cadaveric elbows, with an electro-magnetic tracking device, (3Space Fastrak, Polhemus, Colchester, Vermont, USA). The medial collateral ligament is responsible for 54% of the resistive varus torque, thereby producing 34.6 N-m of torque during throwing. The torques applied in the valgus experimental position were chosen as 5% and 10% of this maximum value; gravity, 1.73 N-m, or 3.46 N-m. Resections of the postero-medial olecranon were sequential 3mm steps, from 0mm to 9mm, which represent the amounts of resection performed in varying clinical practices. Subsequent analysis focussed on one point along the dynamic curve, 90° of flexion, which is of particular relevance for the throwing action, a position known to be most reliant on the integrity of the anterior band of the medial collateral ligament. We measured the changes in valgus and axial ulna angulation by means of eulerian angle measurements. Statistical analysis was initially performed with a two way ANOVA; significant findings were further analyzed by means of post-hoc tests.

Results
Increasing torque, in the valgus stress position, resulted in 1° of valgus angulation with gravity, increasing to 2.1° with 5% throwing torque, and 3.1° with 10% throwing torque. Resections increased valgus angulation incrementally, with valgus stress, in all loading conditions; at 3.46N-m torque 1.1° at 0mm resection, 3.5° at 3mm, 4.1° at 6mm, and 5.9° at 9mm. The differences between the 0mm, 3mm, and 6mm resections compared to the 9mm resection were statistically significant. Further analysis with a paired t-test demonstrated significant differences between the intact and 3mm resection, with increasing significance with increased applied torque. The trends from these data were that increasing resection, regardless of the applied torque, increased valgus angulation (Figure 1). Furthermore, there was a trend demonstrating increasing coupled external rotation with increasing resection, (Figure 2).

Discussion
Our findings challenge the rationale for removing any amount of normal olecranon during the treatment of high performance throwing athletes. The normal bony olecranon is important for the normal kinematics of this highly constrained joint. Partial removal abnormally alters elbow kinematics, which infers increasing strain on the medial collateral ligament, anterior band, with greater resections. The implications for the professional throwing athlete are significant. In our cadaveric model, only 10% of the normal torque across the joint could be repeatably modelled without gross tissue damage. Conceivably with the extremes of load encountered during professional throwing activities either a catastrophic rupture of the medial collateral ligament with higher resections or a more insidious failure with lesser resections are possible. We would recommend that no olecranon bone is resected beyond the osteophytic margin.

Conclusions
1) Removing normal posteromedial olecranon leads to increases in valgus angulation.
2) Reducing the olecranon bone mass posteromedially leads to a decreased moment arm and increased medial collateral ligament tension, with the subsequent risk of ligament overload.
3) The clinical solution that we would recommend would be to resect bone from the olecranon fossa of the distal humerus instead of the posteromedial olecranon process.

References

48th Annual Meeting of the Orthopaedic Research Society

Paper No: 0175