A Novel Simulation Model for Digital Extensor Tendon Injury Repair Training.

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Abstract: Injuries of extensor tendons of hand are more commonly seen than flexor tendons in emergency department. Most of these injuries are initially evaluated and managed by the residents. Results of extensor tendon injury repair are often suboptimal even in the hands of experienced surgeons. While there are many simulation models to train repair of flexor tendon injuries, there is paucity of similar models mimicking extensor tendon injuries. Due to the variable cross-sectional size of the extensor tendon in different zones, it is even more important for the trainees to be acquainted with the intricacies of its repair. Thus, we propose a novel and practical simulation model of extensor tendon injuries for better training of residents and junior surgeons.

Key Words: Simulation model, Extensor tendon injuries, Novel, Residents

Introduction: Injuries of extensor tendons of hand are more commonly seen than flexor tendons in the emergency department.[1] Extensor tendon injuries might lead to serious functional impairment but have received less attention in comparison to flexor tendon injuries historically.[2] More often these injuries are initially evaluated and managed by the residents. Results of extensor tendon injury repair are often suboptimal even in the hands of experienced surgeons because of its complex anatomy at different zones.[3] Due to the variable cross-sectional size of the extensor tendons in different zones, it is even more important for the trainees to be acquainted with the intricacies of its repair. Though few simulation models for tendon injury repair have been described in the literature using feeding tubes, catheters,[4,5] cadavers[6] and pig feet,[7] absence of realism, easy availability and high costs are some of the impediments of these models. Also, there is a paucity of extensor tendon repair simulation models compared to flexor tendon models. Thus, we propose a novel and practical simulation model of extensor tendon injuries for better training of residents and junior surgeons.

Materials and Methods
This model consists of trimming a piece of silicone to mimic the shape and size of the digital extensor tendon expansion in zone 1-6 of hand (Fig 1A,1B,1C). This silicone extensor tendon mimicker may be glued or taped on to the articulated finger joints available in the anatomy department. One can now recreate different types of injury on the model and allow the trainees to repair the tendon using modified Kessler’s, horizontal mattress or locking crisscross continuous stitches. A thin Macintosh rubber sheet in the shape of extensor tendon expansion can also be used to recreate and repair central slip tears / defects. It is possible to simulate the loss of central slip by removing a small segment of the tendon over proximal interphalangeal joint and allow the trainees to address such injury with a distally based turnover flap of tendon for reconstruction as described by Snow (Fig 2A,2B,2C).[8] This model also helps to recreate and repair longitudinal central slip defect using the method described by Aiche (Fig 3A,3B,3C).[9] Similarly, zone 4 and zone 2 injuries of the extensor tendon can be simulated on the proposed model and their repair can be practiced using double modified Kessler with reinforcement by crisscross shoelace sutures (Fig 4A,4B,4C,4D) and continuous running sutures (5A,5B,5C),

Fig 2A - Central slip defect recreated on macintosh rubber sheet; 2B- proximal tendon flap raised; 2C-defect closed with flap and donor area approximated using crisscross suturing.

Fig 3A - Longitudinal central slip tear; 3B- part of lateral band mobilized medially; 3C- defect repaired with crisscross stitches.

Fig 4A - Zone 4 injury; 4B- repair using modified Kessler technique; 4C- double modified Kessler repair; 4D- reinforcement with crisscross shoelace stitch

Fig 5A - Zone 2 injury; 5B- repaired with continuous running sutures; 5C- reinforcement with crisscross stitches.

Conclusion
We recommend this extensor tendon injury simulation model as it can be easily customised to recreate variety of injuries and residents can be trained in repairing such injuries. It does not involve much cost nor biological materials which may need ethical clearance.

Conflict of Interest None

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References