Wrist ligaments). The DIC ligaments were classified into three types. Type A: One rim of the trapezium (45 wrists). Some specimens had thin superficial fiber branches (12.2%). Type IV: A type I with additional separate ligamentous fibers of the DRC ligament attached to the dorsal ulnar horn of the lunate and to 0.91 mm thick at the distal aspect. The average distance between the DRC radial attachment and the DIC ligament of the wrist.

Materials & Methods

Anatomy. The dorsal radiocarpal ligament (DRC) and the dorsal intercarpal ligament (DIC) were dissected in 90 wrists of 45 embalmed cadavers. There were 42 male and 48 female wrists. The age of the specimens ranged from 39 to 97 years (average 76.3 years). There were 45 pairs of wrists. The osseous attachments of the DRC and DIC ligament were documented as well as the ligament type and its dimensions.

Mechanical Properties of the Ligament. Twelve fresh-frozen cadaver wrists of 6 cadavers were used in this study. There were 10 males and 2 female wrists. The age of the specimens ranged from 55 to 79 years (average 63.3 years). In all specimens, the bone-ligament-bone complex was obtained through a dorsal approach: dorsal radius-DRC ligament-triquetrum, triquetrum-DIC ligament-scaphoid. One hole was drilled in each bone into which was inserted a K-wire. Each bone was held in the fixture to maintain the anatomical position and prevent bone rotation. A tensile load was applied to the ligament at a rate of 50mm/min. using a material testing machine (MTS).

Linear distance between the DRC and DIC ligament: The average distance between the DRC radial attachment and the DIC ligament was 20.5 mm in length along the radial rim, 9.16 mm in width at the distal aspect. The linear dimensions between the scaphoid and radius in flexion, extension, radial deviation and ulnar deviation.

Results

Anatomy. Dorsal radiocarpal ligaments. The DRC ligament inserted proximally into the dorsal margin of the distal radius, just ulnar and distal to Lister’s tubercle. It extended ulnar obliquely and distally towards the dorsal tunnel of the trapeziun (90 wrists). The radial fibers of the DRC ligament attached to the dorsal ulnar horn of the lunate and to the dorsal distal region of the lunotriquetral intersosseous ligament (89 wrists). The dorsal radiocarpal ligament types which are modified from Mizuseki’s classification were classified into four types. Type I: The ligamentous fibers attach into the dorsal margin of the distal radius, just ulnar and distal to Lister’s tubercle then extended to the dorsal tunnel of the trapeziun (54.4%). Type II: There was the basic pattern of the type I with an additional ligamentous branch between the dorsal tubercle of the trapeziun and dorsal margin of the distal radius at its extensor carpi radialis longus level (24.4%). Type III: In addition to type II, there were more thin fibers spanning from the dorsal trapeziun to the dorsal radius between the main ligament and ligamentous branch (12.2%). Type IV: A type I with additional separate ligamentous fibers from the ulnar aspect of the radius (9.0%) (Fig. 1). Twenty eight wrist pairs (62.2%) had the same type of DRC ligament. The DRC ligament dimensions averaged 20.5 mm in length along the radial rim, 9.16 mm in width at the proximal aspect, 5.13 mm in width at the distal aspect, 1.11 mm thick at the proximal aspect and 0.91 mm thick at the distal aspect.

Dorsal intercarpal ligament. The DIC ligament originated from the dorsal tunnel of the trapeziun (90 wrists), it attached to the dorsal distal aspect of the lunate (81 wrists), inserted into the dorsal groove of the scaphoid (87 wrists) and dorsal proximal rim of the trapeziun (45 wrists). Some specimens had thin superficial fiber attachments from the trapeziun to the trapezoid (38 wrists) or the capitate (6 wrists). The DIC ligaments were classified into three types. Type A: One single thick fiber (30%). Type B: Two single thick fibers (44.4%). Type C: three or more fibers (25.6%) (Fig. 2). Thirty three paired wrists (73.3%) had the same type of DIC ligament. The DIC ligament dimensions averaged 36.3 mm in length, 5.7 mm in width and 0.83 mm in thickness at its triquetral aspect. In the distribution of the type of the DRC versus DIC ligament, the most common DIC ligament was type I and DIC ligament was type B.

Mechanical Properties of the Ligament. The average maximum load was 143 N for the DRC ligament and 82 N for the DIC ligament, maximum stress was 18 N/mm² for the DRC ligament and 10 N/mm² for the DIC ligament and Young’s modulus was 46 MPa for the DRC ligament and 29 MPa for the DIC ligament. The average Young’s modulus was 46 MPa in the DRC ligaments and 29 MPa in the DIC ligaments. The average Young’s modulus was 46 MPa in the DRC ligaments and 29 MPa in the DIC ligaments. The DRC ligaments were stiffer and stronger than the DIC ligaments. The average distance between the DRC radial attachment and the DIC scaphoid attachment varied from 6.7 mm in wrist extension to 19.8 mm in wrist flexion. The linear dimensions between the scaphoid and radius can increase 3 fold which is beyond the ability of alignment to stretch. The DRC and DIC ligaments form construct which is elegant in its biomechanical design which is both complex, yet simple in its way of delivering indirect dorsal stabilization to the scaphoid at its proximal pole.