Histopathologic Characterization Of The Hip Joint Capsule: Prospective Cohort Study Comparing Patients With Arthritis Versus Neck Of Femur Fractures

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INTRODUCTION: The hip joint capsule passively restrains extreme range of motion (ROM), protecting the native hip against impingement, dislocation, and edge-loading, therefore being an innate stabilizer. Following total hip arthroplasty (THA), this protective biomechanical function might depend on the underlying diagnosis leading to the replacement. While patients with arthritis usually have restricted ROM and rigidity, femoral neck fracture-patients rarely have these characteristics. Usually, patients with previous arthritis tend to suffer extracapsular hip fractures rather than intracapsular ones in the setting of acute trauma. The histological characteristics of the hip joint have not been clearly defined in the context of elective (primary osteoarthritis) or urgent (intracapsular hip fracture) THA. We aimed to histologically characterize the hip joint capsule of a group of patients undergoing THA for primary osteoarthritis versus intracapsular hip fracture.

METHODS: Forty-nine patients treated with THA were prospectively included, and the cohort was divided into 'hip arthritis'- (n=31) and 'intracapsular hip fracture'-groups (n=18). A 2x2 cm sample was taken from the distal region, proximal to the transverse ligament. At least two 4 micrometers-thick sections were obtained and stained with routine techniques (hematoxylin and eosin). Outcome measures were capsular width measured in millimeters, percentage of fibrosis as described by Tibbo *et al (absent [<5%]; minimal [5-10%]; mild [15-25%]; moderate [30-50%]; marked [55-70%]; severe [>75%]), cartilaginous metaplasia (absent versus present), grade of vascularization as per the \alpha-smooth muscle actin criteria (0 [capillaries widely dispersed, devoid of erythrocytes, lined by flattened endothelial cells] to 5 [capillaries substantially greater in density throughout a hypercellular connective tissue, engorged with blood, lined uniformly by plump endothelial cells), presence of inflammatory infiltrate (absent versus present), and cartilaginous metaplasia (absent versus present). Comparison between groups was made with Fisher's test.*

RESULTS: Cartilaginous metaplasia was evidenced only in the osteoarthritis group, which presented 5 cases (16.13% vs 0%, p=0.004). The arthritis-group presented inflammatory infiltrate in 9 cases (29%), while the fracture-group presented such changes in 5 cases (27.9%, p=0.06). Vascular density was predominantly grade 0, with 15 cases in the arthritis-group (48.39%) and 10 cases in the fracture-group (55.56%; p=0.09). The degree of fibrosis was greater in the arthritis-group, with 12 (38.7%) and 4 (22.2%) cases corresponding to grade 3 in the arthritis- and fracture-groups (p=0.004), respectively. The average capsular thickness in the arthritis-group was 5.9mm (IQR:3.95-6.7) and 4.5mm (IQR:3.8-5.4) in the fracture-group (p=0.004).

DISCUSSION AND CONCLUSION: Structural differences were found in the joint capsule of hips with arthritis versus those with femoral neck fractures, with the former group presenting ostensibly greater thickness, cartilage metaplasia and percentage of fibrosis. Although dislocation is likely multifactorial, histological characteristics may have implications in the intrinsic joint stability of an eventual THA.

