

vulnerable individuals; on a non-traumatic surgical technique; on early articular mobilization. Monitoring alkaline phosphatase and urinary PGE's, bone scintigraphy and C.A.T. scan enable an early diagnosis as well as assessment of calcification maturity. Surgical therapy is statistically limited to few frankly symptomatic cases, only in the presence of mature calcifications. Radiotherapy is applicable when calcifications appear, at the stage when they are not yet mature.

## C26—SHOULDER AND ELBOW 6

### Anatomical features of the suprascapular notch: correlation with scapular dimensions and clinical relevance

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**Introduction** An improved knowledge of the suprascapular notch anatomy may help to prevent and to well-assess the suprascapular nerve entrapment syndrome. We aimed to verify the reliability of the existing data, to assess the differences between the two genders, to verify the existing correlation between the dimensions of the scapula and of the suprascapular notch, to investigate the relationship between the suprascapular notch and the postero-superior limit of the safe zone for the suprascapular nerve.

**Materials and methods** We examined 500 dried scapulae, measuring seven distances referring to the scapular body and suprascapular notch; they were also catalogued according to gender, age and side. Suprascapular notch was classified according to Rengachary's method. We elaborated for each class the width/depth ratio. Pearson's correlation was also calculated.

**Results** Frequencies were: Type I 12.4 %, Type II 19.8 %, Type III 22.8 %, Type IV 31.1 %, Type V 10.2 %, Type VI 3.6 %. Width and depth showed a not statistical significant difference when elaborated according to gender and side; a significant difference was found between the depth means elaborated according to median age (73 years old). Correlation indexes were weak or not statistically significant. The difference between the postero-superior limit of the safe zone in the six types of notches was not statistical significant.

**Discussion** We observed a difference concerning the frequencies of the VI Types of suprascapular notch presented in our study respect to those reported in literature. We suppose that the difference between the depth means may be due to the most frequent presence of partial/total ossification of the superior transverse scapular ligament in the population over 73 years old. The characteristics of the suprascapular notch (dimensions and type) are not influenced by age, gender and scapular dimensions.

**Conclusions** A pre-operative evaluation of the patient's characteristics (gender, age and scapular dimensions) does not provide any information about the suprascapular notch. The safe zone is not influenced by the morphologic and morphometric characteristics of the suprascapular notch.

### Pigmented villonodular synovitis of the shoulder associated with massive rotator cuff tear treated with arthroscopic synovectomy and debridement

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**Introduction** Pigmented villonodular synovitis (PVNS) is a rare condition. We present the largest series of patients with shoulder PVNS, massive irreparable rotator cuff tear and gleno-humeral osteoarthritis treated with arthroscopic debridement and synovectomy.

**Materials and methods** We treated 9 patients (6F and 3 M, mean age 65.8 years, range 63–70 years) with PVNS of the shoulder; irreparable rotator cuff tear and slight gleno-humeral arthropathy (group I). Patients underwent arthroscopic synovectomy and debridement. Results were compared with those obtained from a control group (group II) made up of 33 consecutive patients (21F and 12 M) who underwent arthroscopic debridement for irreparable cuff tear and had no (23 patients) or slight (10 patients) gleno-humeral arthropathy (Constant Score).

**Results** The preoperative shoulder function in group I was reduced with respect to group II (CS: 12 vs. 35). Upon follow-up the CS value was lower in group I than in group II (CS: 40 vs. 54). In the preoperative period, the differences between the two groups relating to the CS value and to each item of the score were always statistically significant; instead, upon follow-up, significant differences emerged in the CS value, ADL and ROM. Differences relative to pre-operative CS values in group I and II were statistically significant; while, at the follow-up period, significant differences emerged only between CS values of patients with PVNS and the values of group II without gleno-humeral arthropathy. No differences emerged between pre and post-operative CS values in group II without or with gleno-humeral arthropathy.

**Discussion** PVNS of the shoulder is a rare condition. Recent literature refers on sporadic case reports which affected above all middle aged or elderly patients. Only two papers described respectively of one case of PVNS of the shoulder that occurred in two adolescent males.

**Conclusions** Arthroscopic synovectomy is an effective surgical treatment for PVNS; the poor functional outcome can be attributed to the coexistence of the gleno-humeral arthropathy. Three fourths of patients with PVNS had shoulder osteoarthritis; this percentage cannot be simply attributed to natural history of massive irreparable cuff tears; but a direct role of synovitis has to be considered.

**Level of evidence** Level IV.

### The “double pulley” technique for arthroscopic fixation of partial articular-side bony avulsion of the supraspinatus tendon: a rare case of “bony PASTA” lesion

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**Introduction** The “bony PASTA” lesion is a partial articular-side bony avulsion of the supraspinatus tendon. It was described only once up to date in literature in 2007 by Bathia et al. These authors presented an arthroscopic technique for fixation of the avulsed fragment using a single medial suture anchor with simple mattress sutures. We present the use of the double pulley technique for arthroscopical fixation of bony PASTA lesions.

**Materials and methods** We report the case of a 22 years old man presenting with a bony PASTA lesion to the right shoulder following

a motorbike accident. The lesion was documented with X-rays and MRI exams. The surgical technique involved the use of a 30° and 70° arthroscope. Intraarticular observation documented a 15 long and 5 mm wide avulsion with two principal fragments. Subacromial observation documented the integrity of the lateral insertion of the supraspinatus tendon to the greater tuberosity. Two double-loaded suture anchors were implanted through the lateral intact aspect of the supraspinatus tendon with a transtendinous technique. The anchors were placed at the anterior and posterior extremities of the bony lesion respecting the tendon insertion to the avulsed fragment. Each of the 4 medial sutures was retrieved in the subacromial space through the intact supraspinatus tendon medial to the fracture. Reduction and fixation of the avulsed fragment was initially obtained with a simple suture for each anchor oriented from medial to lateral. The remaining suture wires were coupled in double pulley configuration generating two sutures oriented from anterior to posterior.

**Results** At the end of the procedure adequacy of reduction was confirmed by intra-articular arthroscopic observation throughout complete range of joint motion. At 2 months from surgery the patients fully recovered daylife activities and X-rays and arthro-MRI imaging documented healing of the fracture.

**Discussion** The advantage of the double-pulley configuration is the compression of the osteo-tendinous complex obtained along the whole anterior-posterior length of the lesion, unreachable with medio-lateral oriented simple sutures. Moreover double pulley configuration creates a waterproof reduction of the fragment, protecting the fracture site from the negative effect of synovial fluid on bone healing.

**Conclusions** In our opinion the double pulley technique allows optimal reduction of bony fragments and reconstruction of normal footprint anatomy even in comminuted fractures.

#### **Non-operative management of shoulder adhesive capsulitis: effectiveness of the Lyon hydrotherapy rehabilitation program**

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**Introduction** We evaluated the mid-term efficacy of the Lyon hydrotherapy rehabilitation program in the treatment of adhesive capsulitis.

**Materials and methods** From January 2000 to January 2005, we treated 250 patients with adhesive capsulitis using hydrotherapy rehabilitation according to the Lyon program. The patients were treated for an average of 9 weeks (27 sessions). 180/250 patients (72 %) were re-examined at a minimum of 12 months (range 12–108 months) using the modified Constant score (n = 100) and the VAS scale (n = 100) or the Simple Shoulder Test-SST (n = 80).

**Results** The mean modified Constant score was 82.6 (range 54–90), the mean VAS score was 8.6 (range 2–10) and the mean SST was 10.5 (range 8–12). 10/180 patients (0.5 %) were treated with arthroscopic release.

**Discussion** The Lyon hydrotherapy rehabilitation program gives good mid-term results as regards objective shoulder scores, range of motion and patient satisfaction. Consequently, this non-operative intervention may be considered for patients affected by adhesive capsulitis.

**Conclusions** The Lyon hydrotherapy rehabilitation program results in good outcome about pain and range of motion. The mid-term results regarding objective shoulder scores and patient satisfaction are high. The failure rate was low, so this non-operative intervention may be considered for patients affected by adhesive capsulitis.

#### **C27—SPINE 5**

##### **Indication to occipito-cervical fusion in upper cervical spine instability**

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**Introduction** Occipito-cervical (OC) fusion and instrumentation is indicated for a variety of conditions with OC instability. The causes of OC instability include trauma, inflammatory disorders, infection, tumours, iatrogenic decompression, and congenital anomalies. The indication for OC fusion in trauma patients, an extensive posterior instrumentation fixation procedure that sacrifices the motion of the occipital and C1–2 complex and a variable amount of subaxial motility, is still controversial.

**Materials and methods** In a clinical retrospective study, the authors reviewed clinical and radiographic results of occipito-cervical fusion in 12 patients with upper cervical spine trauma, and 5 patients with cranio-cervical junction abnormalities, including atlanto-axial instability and progressive basilar invagination.

**Results** The average surgical time was 190 min (range 130 to 270 min). Postoperative analgesia was performed in all cases with a 36 h lasting elastomeric pump containing an opioid and an NSAID. All the patients were granted an immediate mobilization in the bed with a soft collar. Two elderly patients died of pneumonia after 6 and 8 days in ICU. No surviving patient had neurological deterioration postoperatively. All patients with basilar invagination improve the neurological function, measured with the scale of Nurick, and the radiographic parameters.

**Discussion** OC fusion is a surgical procedure that affects almost the entire normal range of motion of the head. It should be so reserved in selected cases of instability of the cranio-cervical junction causing neurological deficits or potential serious neurological damage. In the field of traumatology absolute indication for OC arthrodesis is the atlanto-occipital dissociation. In cases of basilar invagination is a safe operation, with good clinical and radiographic results.

##### **Results at three years following the implant of interspinous spacers (X-STOP and BAC-JAC PIONEER) for the treatment of neurogenic claudication caused by lumbar stenosis: our experience of 263 cases conducted between December 2007 and December 2011**

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**Introduction** Backache is an extremely common pathology. Every year in the United States alone medical costs exceed \$100 billion and specialists perform more than 15 million examinations. Approximately 4 % of patients suffering from chronic backache are affected by neurogenic claudication caused by lumbar stenosis. Currently the most common conservative treatments for lumbar stenosis are physiotherapy, rest, medical therapy, local corticosteroid infiltrations; invasive surgical treatments range from laminectomy to stabilisation with means of synthesis. Interspinous spacers, already described in the 1950 s, represent a valid alternative for the treatment of lumbar stenosis. The current, technically improved, devices have a high