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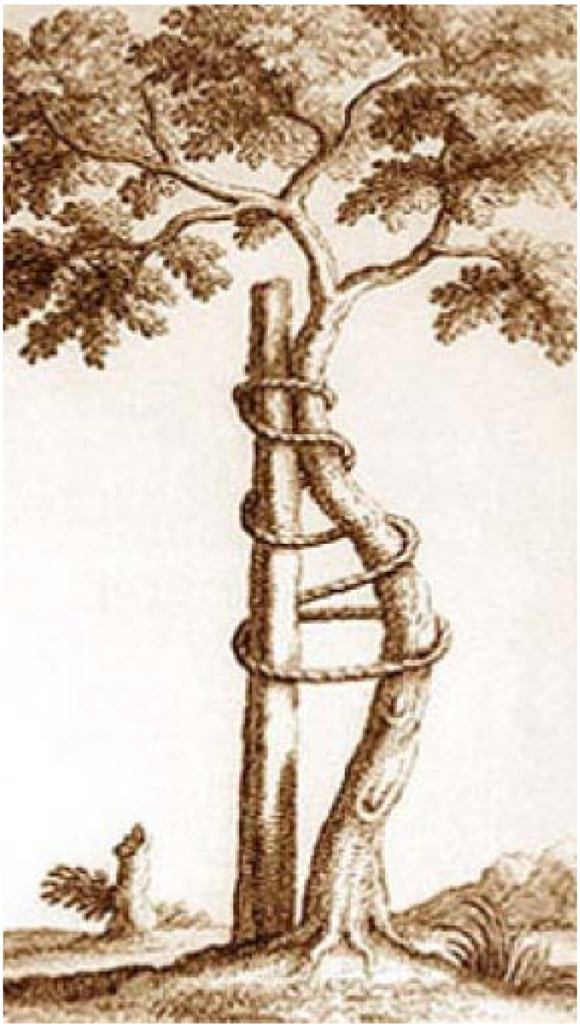

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1.Survival and functional outcome after revision of a unicompartmental to a total knee replacement. The NZ Joint Registry. J Bone Joint Surg [Br] 2010;92-B:508-12.

Abstract: We reviewed the rate of revision of unicompartmental knee replacements (UKR) from the
New Zealand Joint Registry between 1999 and 2008. There were 4284 UKRs, of which 236 required revision, 205 to a total knee replacement (U2T) and 31 to a further unicompartmental knee replacement (U2U). We used these data to establish whether the survival and functional outcome for revised UKRs were comparable with those of primary total knee replacement (TKR). The rate of revision for the U2T cohort was four times higher than that for a primary TKR (1.97 vs 0.48; $p < 0.05$). The mean Oxford Knee Score was also significantly worse in the U2T group than that of the primary TKR group (30.02 vs 37.16; $p < 0.01$). The rate of revision for conversion of a failed UKR to a further UKR (U2U cohort) was 13 times higher than that for a primary TKR. The poor outcome of a UKR converted to a primary TKR compared with a primary TKR should contra-indicate the use of a UKR as a more conservative procedure in the younger patient.

The improvement in implant design, the reliable relief of pain achieved and a good early functional outcome
have promoted the use of UKR over high tibial osteotomy. It was expected that UKR would be a satisfactory initial procedure for these patients, and that the subsequent conversion to a TKR would give an acceptable result comparable with that of primary TKR and better than that achieved by converting a high tibial osteotomy to a TKR.
If we look at a younger cohort from the New Zealand Joint Registry's nine-year report,8 the rate of revision for primary UKR was 1.85 per 100 component years (95% CI 1.51 to 2.25) compared with 0.66 (95% CI 0.57 to 0.75) for primary TKR in the 55- to 64-year age group.

A further study has suggested that the results of TKR for a failed UKR are as good as those of a primary TKR,
in terms of both survival and functional outcome.4 However,the results of our current study have shown that the
U2T is not as successful as primary TKR, and has a fourfold increase in the early rate of revision at 2.81 years of

follow-up. The functional outcome is also significantly worse ($p < 0.01$) than that of primary TKR. The mean sixmonth Oxford score of U2T was similar to that of a revision TKR (30.02 vs 29.37).

We have previously shown a strong correlation between a poor (< 27) six-month OKS and early revision of a primary knee replacement.16 This is especially true for those with a primary UKR, who have a 24.3% risk of revision within two years. One possible explanation for this could be that the revision of a UKR was perceived as technically less demanding than revising a TKR, thereby resulting in a lower surgical threshold to offer early revision surgery to patients who complained of ongoing problems with a UKR.
In addition, a higher proportion of patients with a UKR were younger, which has been shown to lead to higher rates of revision8-11 because the younger group are likely to demand more of their prostheses, resulting in early wear and failure.

The mean age of this group was only 61.7 years (39 to 74). Of the revised UKRs, 58.1% required exchange of a bearing exchange following dislocation. The disproportionate number in the U2U group suggests that a simple exchange of bearing did not address the fundamental cause of failure. This could have been due to an inexperienced surgeon not recognising other problems, such as malalignment or unequal flexion and extension gaps.

Other national registry studies have concluded that the increased rate of failure of a UKR over a TKR negates any economic saving in the long term.21This study shows that converting a failed UKR to a TKR gives a less reliable result than a primary TKR in the short term, and that the functional results are not significantly better than a standard revision from a primary TKR. These results are independent of surgical experience. The question of how to manage the younger patient with unicompartmental osteoarthritis remains unanswered. The place of UKR needs to be clearly defined: it should not be used as a ‘conservative’ procedure to delay TKR.

2. Complications in shoulder arthroplasty: an analysis of 485 cases. International Orthopaedics (SICOT) (2010) 34:517–524

Abstract The aim of this study was to analyse the complication rates of six different shoulder arthroplasty concepts for different diagnoses in the short and midterm.

The study included 485 primary shoulder arthroplasties. The mean follow-up of the cohort was 3.5 (1–10) years. Complications were classified into three categories:

(1) without reoperation,

(2) soft tissue revision

(3) implant revision.

In total, 56 complications were recorded (11.6%): 34 (7%) were category 1 complications, 11 (2.3%) were category

2 11 (2.3%)

3. 4.6%

For the whole cohort the median follow-up was 1.6 years (1–10 years) and the survival rate without any complication was 90.5% (95% CI: 87.9–93.1).

Patients rated the result of their surgery in 270 (55.7%) cases as very satisfied, in 148 (30.5%) as satisfied, in 43 (8.9%) as somewhat disappointed and in 24 (4.9%) as disappointed.

A relatively low complication rate was found in this study. Longterm observations are necessary to confirm these results.

Survival rates

With regard to the diagnoses included, the best survival rates were found for the osteoarthritis and osteonecrosis cohort

Post fracture	90%
Post Tr Arthritis	85%
RA	80%
OA	93%
Cuff tear arthropathy	89%
AVN	93%

In TSA Vs Loosening

In 2,540 shoulders a percentage of glenoid component loosening of 5.3% and humeral component loosening of 1.1% at 5.3 years was stated.

The second most common complication was instability of the glenohumeral joint (4.9%)

Periprosthetic fractures (1.8%;intraoperative 1.1%, postoperative 0.7%),

Rotator cuff tears (1.3%), neural injuries (0.8%) and infections (0.7%).

The most common complications in our TSA group (n=197) were humeral fractures (3%; intra- and postoperative 1.5%, respectively) followed by nerve palsy (2.6%), dislocation and rotator cuff tears

(1.5%, respectively)

The results of hemiarthroplasty are inferior compared to TSA with regard to pain relief, motion and activity . However, many surgeons are concerned about using glenoid components especially in cases of preoperative irreparable rotator cuff tears, glenoid wear or young patients with respect to the survival of the component

In the study of Bailie et al. A complication rate of 16.7% was reported using resurfacing arthroplasty The rates in other studies seem to be comparable and vary between 3% and 20% without resurfacing the glenoid. In contrast to the above-mentioned studies, we found a relatively high number of postoperative glenoid erosions (5.2%) and total number of complications (13%).

The number of implant revisions was higher than in the cohort treated with a reversed implant (5.2 vs 3.7%). One reason for these findings might be the high number of post-traumatic osteoarthritis and cuff tear arthropathies in our series

The main indications for reversed implants are rotator cuff tear arthropathies, revision arthroplasties without an intact rotator cuff tear, fractures . Reoperation rates for reverse arthroplasty in cases of cuff tear arthropathies are described in up to 18% of cases

In our cohort, implant dislocation leading to revision surgery was the most common complication (n=4; 8.2%).

In conclusion, shoulder arthroplasty is a very successful operation with an acceptable rate of complications in the short and midterm

3.Locked Plate Fixation of Osteoporotic Humeral Shaft Fractures: Are Two Locking Screws Per Segment Enough? J Orthop Trauma 2010;24:207–211)

Conclusions: The addition of a third screw in the locked plate construct did not add to the mechanical stability in axial loading, bending, or torsion. In testing to failure, the addition of a third screw resulted in lower load to failure. When using locked plate fixation, the number of screws and the number of cortices needed per segment continues to be a topic of debate. In this study, we found no mechanical advantage for using more than two locking screws per bone segment in an osteoporotic humerus fracture gap model.

In this gap osteotomy model, the mechanical properties of the construct appeared to be most influenced by the mechanical properties of the plate between the two inner locking screws. The distance between the two inner screws was not altered between the two groups. The torque to failure was actually less when three screws were used compared with two. **The three closely spaced screws may create a linear stress riser leading to reduced resistance to fracture.**

Based on the clinical observation :

Hertel et al recommended obtaining at least three cortices per segment.

In good quality bone, Gautier and Sommer have recommended using a minimum two screws per segment with at least three cortices for simple fractures and at least four cortices for comminuted fractures.

In other cases such as osteoporotic bone, they have recommended a minimum of three screws per segment. In osteoporotic bone, Wagner has recommended the use of at least three locking screws in each main fragment with at least one of them being bicortical.

Screw location and plate length may be as important as screw number, because it influences the construct stiffness and amount of motion seen at the fracture. Stoffel et al examined different screw configurations using a 12-hole 4.5-mm titanium locking compression plate in composite synthetic bone cylinders. They found that axial stiffness and torsional rigidity were mainly influenced by the distance between the fracture site and the closest screw. Moving the screw one hole farther from the fracture the construct became almost twice as flexible in compression and torsion.

Similar observations have been noted with nonlocking plate fixation. In a study using composite foam blocks, To¨ rnkvist et al showed that the bending strength of screw–plate fixation can be increased by using a longer plate with screws spaced further apart.

In a cadaveric ulnar osteotomy model, Sanders et al concluded that the length of the plate is more important than the number of screws and stated that once the working length (defined as the distance between the fracture and the nearest screw) is minimized and the plate length maximized, only two screws need to be inserted on each side of the fracture.

Similarly, in our study using the same length plate, we found no advantage to the placement of a third locking screw in between two equally spaced screws. Internal fixation of long bone fractures in the elderly patient is challenging secondary to the problems of osteoporotic bone. In osteoporotic bone, poor screw purchase results in sequential loosening of nonlocked screws and subsequent levering of the plate away from the bone. Loss of nonlocked screw purchase in osteoporotic bone is an important factor leading to failure of internal fixation of humeral shaft fracture fixation. The development of locking plates has provided an alternative to standard compression plates. Locking plates can provide fracture fixation without the undesirable effects on periosteal vascularization and mechanical drawbacks that are encountered with standard compression plates. In a retrospective clinical study comparing the use of locked plates and standard plates in the treatment of humeral nonunions and delayed unions, the authors suggested that locking plates may be a more reliable implant. There was one hardware failure in the 14 patients treated with standard plates but no failures in the 19 patients treated with a locked plate construct.

In standard plates, the biomechanical effect of different fixation constructs in torsion differs from that seen in bending. To¨ rnkvist et al showed that in torsion, the fixation strength was dependent on the number of screws securing the plate. In comparison, in the locking plate construct, we did not see an improvement in the fixation stability with the addition of a third screw per fracture segment. The locking plate eliminates screw pullout as a means of failure in torsion as demonstrated by our study.
One potential advantage of the locked plate construct is prevention of screw loosening through repeated loading.

4.The association between intraoperative correction of Dupuytren's disease and residual postoperative contracture. J Hand Surg (Eur) 2010; 35; 220

The purpose of this study was to determine whether preoperative contracture and the amount of intraoperative correction can be used to predict the postoperative outcome of fasciectomy for Dupuytren's disease.

A prospective study of 52 patients undergoing primary fasciectomy during an 18 month period was undertaken. The contracture of each joint was measured preoperatively, after fasciectomy during the operation and 6 months after surgery. Forty-two Metacarpophalangeal (MCPJ) and 58 proximal interphalangeal (PIPJ) joints were treated surgically. Full intraoperative correction was achieved in 41 MCPJs. Thirty-seven had full correction at follow-up.

Full intraoperative correction was obtained in 35 PIPJs and 13 had complete correction at follow-up. The extent of the preoperative deformity was a significant predictor of complete intraoperative correction. The extent of both preoperative deformity and intraoperative correction were significant predictors of loss of surgical correction after operation.

DISCUSSION

This study demonstrated that surgery for Dupuytren's disease at the metacarpophalangeal joint is likely to provide full intraoperative correction.

Studies have also assessed the outcome of Dupuytren's surgery for PIPJ contracture. Draviaraj 2004 reported that correcting joint deformity in Dupuytren's disease leads to an improvement in hand function. PIPJ rather than MCPJ correction correlated better with hand function. We did a sequential release of structures (Andrew, 1991) of the PIPJ if the contracture remained greater than 30_ after fasciectomy. Sequential PIPJ release has been shown to give good results with few complications (Ritchie et al., 2004).

Abe et al. (2004) demonstrated that those with a worse preoperative deformity were more likely to have a worse postoperative outcome.

Our study reaffirms that preoperative deformity is a significant predictor of complete intraoperative correction and complete correction at follow-up. Misra et al. also demonstrated that residual intraoperative contracture was a predictor of worse postoperative contracture.

Our study has demonstrated that patients with greater intraoperative correction are more likely to lose some correction after operation. Patients who a large preoperative deformity at the PIPJ, which is fully corrected at operation, are more likely to lose some correction by 6 months. Conversely, a patient with a large preoperative deformity, which is partially corrected intraoperatively is more likely to sustain the correction that was achieved at operation. This is helpful information in counselling patients immediately after operation.

This study does have some limitations. The number of joints analysed in the study did not allow statistically significant conclusions to be made about other confounding factors such as patient demographics, multiple joint involvement and the finger affected. The study also does not answer the question whether it is better for a patient with a given preoperative deformity to have a smaller correction, with a better chance of maintaining it, or a larger correction with an increased chance of losing some of it postoperatively.

The definitions of recurrence after Dupuytren’s surgery include recurrence of contracture and recurrence of Dupuytren’s disease. Dupuytren’s disease is a fibroproliferative disorder with no cure and so it is inevitable that recurrence will occur at some stage. However, recurrence of the disease is likely to be a long-term event. Recurrence of flexion contracture is commonly seen in the early postoperative period as is demonstrated by our study. Rives et al. (1992) demonstrated that recurrence of flexion contractures was evident by 3 months and did not significantly change over the first 12 months postoperatively.

5. Relationship of Tear Size and Location to Fatty Degeneration of the cuff. J Bone Joint Surg Am. 2010;92:829-839

Background: Fatty degeneration of the rotator cuff muscles may have detrimental effects on both anatomical and functional outcomes following shoulder surgery. The purpose of this study was to investigate the relationship between tear geometry and muscle fatty degeneration in shoulders with a deficient rotator cuff.

Methods: Ultrasonograms of both shoulders of 262 patients were reviewed to assess the type of rotator cuff tear and fatty degeneration in the supraspinatus and infraspinatus muscles. The 251 shoulders with a full-thickness tear underwent further evaluation for tear size and location. The relationship of tear size and location to fatty degeneration of the supraspinatus and infraspinatus muscles was investigated with use of statistical comparisons and regression models.

Results: Fatty degeneration was found almost exclusively in shoulders with a full-thickness rotator cuff tear. Of the 251 shoulders with a full-thickness tear, eighty-seven (34.7%) had fatty degeneration in either the supraspinatus or infraspinatus, or both. Eighty-two (32.7%) of the 251 full-thickness tears had a distance of 0 mm between the biceps tendon and anterior margin of the tear. Ninety percent of the full-thickness tears with fatty degeneration in both muscles had a distance of 0 mm posterior from the biceps, whereas only 9% of those without fatty degeneration had a distance of 0 mm. Tears with fatty degeneration had significantly greater width and length than those without fatty degeneration ($p < 0.0001$). Tears with fatty degeneration had a significantly shorter distance posterior from the biceps than those without fatty degeneration ($p < 0.0001$). The distance posterior from the biceps was found to be the most important predictor for supraspinatus fatty degeneration, whereas tear width and length were found to be the most important predictors for infraspinatus fatty degeneration.

Conclusions: Fatty degeneration of the rotator cuff muscles is closely associated with tear size and location. The finding of this study suggests that the integrity of the anterior supraspinatus tendon is important to the development of fatty degeneration. Patients with full-thickness tears that extend through this area may benefit from earlier surgical intervention if fatty degeneration has not already occurred. Additionally, the findings suggest the importance of secure fixation and healing of the anterior aspect of the supraspinatus with surgical repair

Discussion

The fatty degeneration was found almost exclusively in the shoulders with a full-thickness tear, whereas shoulders with a partial thickness tear or an intact rotator cuff did not have fatty degeneration;

The distance between the biceps tendon and the anterior margin of a full-thickness tear was significantly smaller in shoulders with fatty degeneration

Our results indicate that the possibility of developing fatty degeneration in the supraspinatus and infraspinatus increases as a tear enlarges in length or width. This implies that the degree of tear retraction is one of the key factors that are related to the development of fatty degeneration.

Although the duration of a tear is also an important factor, it was not investigated in the present study because it is nearly impossible to determine when a chronic rotator cuff tear started. Animal studies have demonstrated that fatty degeneration of the muscle progresses with time after rotator cuff tendon detachment

Our results demonstrate that the probability of fatty degeneration developing in the supraspinatus and infraspinatus increases when a tear involves the more anterior aspect of the supraspinatus tendon. It may not be surprising that a larger tear has a shorter distance from the biceps and, consequently, has a higher probability of developing fatty degeneration than a smaller tear.

The findings suggest that the integrity of the most anterior part of the supraspinatus tendon insertion may be important in preventing the development of fatty degeneration in the supraspinatus muscle.

2 possible explanations may be considered. First, the most anterior part of the supraspinatus tendon insertion is known as the location where the anterior end of the so-called rotator cable inserts. It has been postulated that the rotator cable stress-shields the rotator crescent, a site where most rotator cuff tears initiate. The rotator cable allows the supraspinatus to transmit its muscle force to the humerus, even in the presence of a tear, by means of its distributed load along the span of the suspension bridge configuration. Disruption ofrotator cable

insertions may cause a torn tendon end to retract farther and, with time, the muscle may shorten and develop fatty degeneration.

In the present study, not only large to massive tears but also many small to mediumsized tears (68%; twenty-five of thirty-seven) were found to have fatty degeneration when they involved the most anterior part of the supraspinatus tendon insertion. These findings are in good concordance with the rotator cable concept.

Another possible explanation for our findings is the unique anatomy of the supraspinatus insertion that was recently reported by Mochizuki. The most anterior 1.3 mm of the rotator cuff footprint is composed of purely the supraspinatus. From this point, the next 11.3 mm of the tendon insertion consists of the supraspinatus medially and the infraspinatus laterally. The anterior several millimeters of the supraspinatus is a strong tendinous structure and is thought to perform the main functional role of the tendon .

Disruption of this anterior tendinous structure, especially the most anterior few millimeters, may be associated with more serious changes in the mechanical and biological environment of the muscle than disruption of the posterior portion of the cuff insertion.

We also found that fatty degeneration in the infraspinatus was more closely associated with tear length and width than distance posterior from the biceps tendon. This finding implies that, in contrast to the supraspinatus, fatty degeneration of the infraspinatus is affected by the size and the extent of retraction rather than the location of the tear.

First, ultrasound is a less commonly used imaging modality to assess fatty degeneration than is magnetic resonance imaging or computed tomography. The accuracy of ultrasound in the detection of fatty degeneration of the rotator cuff muscles has not been validated in our institution yet.

6.Osteochondral Lesions of the Talus Treated With Fresh Talar Allografts Foot & Ankle International/Vol. 31, No. 4: 276l 2010

Lesions in the talus were first reported in 1856 by Munro and osteochondral defects of the talus (OLT) were identified by Kappis in 1922.

Conservative treatment is often unsuccessful with results unsatisfactory in 50% of adult patients.

If symptoms persist, initial surgery usually consists of arthroscopic debridement and microfracture. Success rates up to 80% . If, after 6 months, arthroscopic treatment results are not satisfactory, patients may be offered a repeat arthroscopic debridement and microfracture, or one of the cartilage resurfacing procedures.

The method chosen for surgery depends on the surgeon's skill level and familiarity with a procedure as well as the ability to obtain the necessary materials.

These options

1. OATS procedure [Mosaicplasty]
2. The ACI procedure
3 local autologous transplant procedures
3. Frozen allograft transfer: success rates of 90%

OATS is limited in the location, size, and shape of the defect that needs to be filled, as the material is obtained from a healthy knee and is thus limited in quantity.

ACI results also have been reported as being 90% successful with an intermediate length of followup.

limitations:

ACI requires two different surgical episodes:I.involves removal of cartilage tissue cells, either from the knee or the talus. The cells are cultured for 6 to 8 weeks

II. to fill the lesion, can be performed.

Cyropreserved, or frozen allografts, have been used with reported success for many years, especially in the knee.

Had been frozen less than 14 days before transplantation.

Only 50% to 70% of the transplanted cells survived compared to a 95% to 99% survival rate for transplanted fresh cells.

All the allografts in this study were procured and implanted between 14 and 28 days of harvesting and were fresh, not frozen.

The authors chose to use FTAT because the surgery is technically easier, the authors have prior experience with allografts, and the surgery only involves one site and one episode.

7. Schmorl’s nodes distribution in the human spine. and its possible etiology. Eur Spine J (2010) 19:670–675

Abstract

Although Schmorl’s nodes (SNs) are a common phenomenon in the normal adult population, their prevalence is controversial and etiology still debatable.

The objective was to establish the spatial distribution of SNs along the spine in order to reveal its pathophysiology.

In this study, we examined 240 human skeleton spines for the presence and location of SNs. To determine the exact position of SNs, each vertebral body surface was divided into 13 zones and 3 areas (anterior, middle, posterior).

Our results show that SNs appeared more frequently in the T7-L1 region.

The total number of SNs found in our sample was 511

193 (37.7%) were located on the superior surface and 318 (62.3%) on the inferior surface of the vertebral body.

SNs were more commonly found in the middle part of the vertebral body (63.7%).

No association was found between the SNs location along the spine and gender, ethnicity and age.

The results do not lend support to the traumatic or disease explanation of the phenomenon. SNs occurrences are probably associated with the vertebra development process during early life, the nucleus pulposus pressing the weakest part of the end plate in addition to the various strains on the vertebrae and the intervertebral disc along the spine during spinal movements (especially torsional movements).

Why do SNs concentrate more in the thoracic region? And what does this imply?

Probably more susceptible to stress.

The major obstacle to traumatic theory is: is that vertebral fractures usually involve the superior vertebral body surface, whereas SNs mainly occur on the inferior vertebral body surface.

It is therefore unlikely that the distribution of SNs can be explained solely by differences in the load magnitude along the spine. Additionally, if extra load would have been the sole cause for SNs development, we would expect increasing prevalence of SNs from T1 to L5 (maximum load), yet this is not the case. Therefore, the higher prevalence of SNs in the mid and lower thoracic region compared to the lumbar region suggests that other factors might be involved

Consequently, the lumbar vertebrae may have better resistance to herniation of the intervertebral disc into the body than the thoracic ones; (b) the thoracic vertebrae are more prone to rotational movement while in the lumbar area the torsion is minimal compared to movements on the sagittal plane.
The lumbar vertebrae are much larger and therefore better resist stress.

Why are SNs more common on the inferior surface of the thoracic vertebrae (T4–T11) and on the superior surface of the lumbar vertebrae (L1–L5)?
The relatively higher frequency of SNs on the inferior vertebral surface of the thoracic vertebrae compared to the superior surface is in concordance with several previous reports. At present, no convincing explanation has been suggested for this phenomenon.
We believe that the key could be in the developmental process of the vertebrae during early life. The formation of vertebral bodies begins approximately at the fourth week of embryonic life .
The vertebral body develops from the fusion of the dense caudal portion of each sclerotome with the loose cranial portion of the adjacent sclerotome . This developmental process may suggest that the inferior half of the vertebral body is mechanically weaker, at least in the early years of life, than the superior half.

Why do not the lumbar vertebras show the same trend?
SNs is multi-factorial,depending not just on the relative strength of the two segments of the vertebral body, but also on the amount of torsional movement.
The fact that the tensile strain at the superior vertebral body surfaces of the lumbar vertebrae is higher than in the inferior surface , may partially explain the pattern distribution of SNs in this area..

SNs positions on the vertebral body surface

We found that most SNs appear in the middle part of the vertebral body surface or slightly posterior to it.

Our findings of the SNs location in the middle-posterior part of the vertebral body surface corresponds with the location of the nucleus pulposus inside the intervertebral disc, the position of the notochord and the thinnest part of the endplate.

These characteristics cause the center of the vertebral body to become the weakest part of the vertebral end-plate

We suggest a model explaining the pathophysiology of SNs.

The model is not yet completed; however, it offers a reasonable explanation

Following the adoption of erect posture and bipedal locomotion, the human spine had to cope with two contradicting requirements, i.e., the need for wide range of motion on one hand and stability on the other. Many of our daily activities require considerably rotational movements

During adolescence, any movement will pose considerable stress on the endplate, especially twisting forces at its center. The outcome of these repetitive movements is small micro-fissures appearing in the central part of the cartilaginous endplate, enabling fluid to travel through and reach the bony surface.

Summarizing the above, it may well be that the combination of increased range of rotational movement, location of axis of rotation and low ratio of disc thickness to vertebral body height in the thoracic spine makes the endplate more vulnerable to micro-tear and to the development of SNs.

Certainly, other factors (e.g., trauma) can contribute to the formation of SNs, but considering the high prevalence of the phenomenon, they are not central.

8. Nerve Injuries Associated With Pediatric Supracondylar Humeral Fractures: A Meta-analysis. J Pediatr Orthop 2010;30:253–263

Background: Supracondylar fractures of the humerus are the most common type of elbow fracture in children. Of all complications associated with supracondylar fractures, nerve injury ranks highest, although reports of the incidence of specific neurapraxia vary. This meta-analysis aims primarily to determine the risk of traumatic neurapraxia in extension-type supracondylar fractures as compared with that of flexion-type fractures; secondarily it aims to use subgroup analysis to assess the risk of iatrogenic neuropraxia induced by pin fixation.

Methods: A literature search identified studies that reported the incidence of nerve injury presenting with displaced supracondylar fractures of the humerus in children. Meta-analysis was subsequently performed to evaluate the risk of traumatic neurapraxia associated with supracondylar fractures. Subgroup analysis of included articles was additionally performed to assess the risk of iatrogenic neurapraxia associated with lateral-only or medial lateral pin fixation.

Results: Data from 5148 patients with 5154 fractures were pooled for meta-analysis. Among these patients, traumatic neuropraxia occurred at a weighted event rate of 11.3%. Anterior interosseous nerve injury predominated in extension-type fractures, representing 34.1% of associated neurapraxias; meanwhile, ulnar neuropathy occurred most frequently in flexion-type injuries, representing 91.3% of associated neurapraxias. Nerve injury induced by lateral-only pinning occurred at a weighted event rate of 3.4%, while the introduction of a medial pin elicited neurapraxia at a weighted event rate of 4.1%. Lateral pinning carried increased risk of median neuropathy, whereas the use of a medial pin significantly increased the risk of ulnar nerve injury.

Conclusions:

Of nerve injury associated with extension-type fractures, anterior interosseous neurapraxia ranks highest, whereas of flexion-type neuropathy, ulnar nerve injury predominates. We confirm that medial pinning carries the greater overall risk of nerve injury as compared with lateral-only pinning and that the ulnar nerve is at risk of injury in medially pinned patients. We additionally suggest that lateral pinning carries neurapraxic risk with respect to the median nerve.

Extension-type Fractures

With findings of anterior interosseous nerve injury of 21% among 57 patients, Campbell et al6 have strongly reinforced the notion that the anterior interosseous nerve is the most frequently injured as a result of extension-type fracture

Although the median and anterior interosseous nerves are especially susceptible to injury during posterolateral displacement of the distal fragment,, posteromedial displacement is thought to biomechanically increase the risk of radial neurapraxia.

Interestingly, posteromedial is reported at a rate of 2 to 3 times that of posterolateral displacement3; although it is not uncommon for median and anterior interosseous nerve injury also to occur in conjunction with posteromedial displacement, it is not surprising that, in contrast to our findings, the radial nerve represents the most commonly injured nerve in certain study populations.

The anterior interosseous deficiency may not be reported clinically, as the nerve solely serves motor and not sensory function. The nerve thus has potential to be overlooked during the neurological examination, particularly if the examined child is experiencing pain

9.**Risk of revision after THR in Statin Users: A Nationwide Population-Based Nested Case-Control***J Bone Joint Surg Am.* **2010;92:1063-1072.**

Background: Statins have been associated with beneficial effects on bone metabolism and inflammation in both experimental and clinical studies. The association between statin use and the risk of revision after primary total hip arthroplasty has not been examined.

Methods: We identified 2349 patients from the Danish Hip Arthroplasty Registry who underwent revision of a primary total hip replacement in the period from 1996 to 2005 and matched them, using propensity score matching, with 2349 controls with a total hip replacement who had not had a revision. Using conditional logistic regression, we estimated the relative risk of revision due to all causes and due to specific causes according to postoperative statin use.

Results: The ten-year cumulative implant revision rate in the underlying cohort of 57,581 total hip arthroplasties from the registry was 8.9% (95% confidence interval, 8.4% to 9.4%). Postoperative statin use was associated with an adjusted relative risk of revision of 0.34 (95% confidence interval, 0.28 to 0.41) compared with no use of statin. Statin use was associated with a reduced risk of revision due to deep infection, aseptic loosening, dislocation, and periprosthetic fracture. No difference in the risk of revision due to pain or implant failure was found between statin users and nonusers.

Conclusions: The use of statins was associated with a substantially lower revision risk following primary total hip arthroplasty. Statins, however, should not be prescribed to healthy patients undergoing total hip arthroplasty in order to improve the longevity of the replacement until further studies have confirmed our finding and the mechanisms for this association have been clarified.

10. The influence of the size of the component on the outcome of resurfacing arthroplasty of the hip.   JBJS 92-B, No. 4, 2010

The survivorship of contemporary resurfacing arthroplasty of the hip using metal-on-metal bearings is better than that of first generation designs, but short-term failures still occur. The most common reasons for failure are fracture of the femoral neck, loosening of the component, osteonecrosis of the femoral head, reaction to metal debris and malpositioning of the component.

In 2008 the Australian National Joint Registry reported an inverse relationship between the size of the head component and the risk of revision in resurfacing hip arthroplasty. Hips with a femoral component size of <44 mm have a fivefold increased risk of revision than those with femoral components of >55 mm irrespective of gender.

We have reviewed the literature to explore this observation and to identify possible reasons including the design of the implant, loading of the femoral neck, the orientation of the component, the production of wear debris and the effects of metal ions, penetration of cement and vascularity of the femoral head.

Our conclusion is that although multifactorial, the most important contributors to failure in resurfacing arthroplasty of the hip are likely to be the design and geometry of the component and the orientation of the acetabular component.

II Recent Concept: **Management of Articular Cartilage Defects of the Knee. Bedi.** J Bone Joint Surg Am. 2010;92:994-1009.

Bone Marrow Stimulation: Microfracture

*Bone marrowstimulation is the most frequently used technique for treating small symptomatic lesions of the articular cartilage

*The costs are low compared with those of other treatment

* Bone marrow stimulation techniques involve perforation of the subchondral plate in order to recruit mesenchymal stem cells from the bone marrow space into the lesion4,5.

*The mesenchymal stem cells are able to differentiate into fibrochondrocytes,

*The formation of a stable blood clot that maximally fills the chondral defect is important, and it has been correlated with the success of bone marrow stimulation procedures7.

*Reparative fibrocartilage consists of type-I, type-II, and type-III collagen in varying amounts.

*The fibrocartilage does not resemble the surrounding hyaline cartilage (Type II)

*The calcified cartilage layer at the base of the lesion must be removed

*The prepared channels must be of sufficient depth to ensure penetration of the subchondral plate and communication with the marrow. Fatty droplets should be seen to emanate from the channel *

The postoperative regimen after bone marrow stimulation procedures is demanding

* Patients with a femoral condylar lesion are initially treated with CPM 0º to 60 º ; NWB x 6 weeks

Patients who have a patellar or trochlear defect are allowed to WB as tolerated with ROM 0 º to 40 º

Between 1 and 4 cm2. Overall, knee function was good to excellent in 2/3rd

Histological assessment demonstrated hyaline-like or mixed hyaline/fibrocartilage-like tissue in 29% of the patients in the microfracture group and 50% of those in the group treated with autologous chondrocyte implantation.

Several recent studies have focused on the outcomes of microfracture in high-level athletes. 76% returned to football the season following the microfracture.

Proper patient selection and meticulous attention to technical detail are critical to achieving a successful outcome

*Patients less than 40 years of age

*Osseous overgrowth has been found to occur after errant removal of the subchondral bone during the microfracture procedure. 25% to 49% and can lead to adverse biological and biomechanical outcomes.

*Adjuncts to Bone Marrow Stimulation Adjuncts to improve the stability of the clot and the lesion fill

The addition of chitosan, a thrombogenic and adhesive polymer, resulted in improved lesion fill, cellular

*Platelet-Rich Plasma: The theoretical advantage of this autologous blood product rests in the concentrated platelets and associated quantity of platelet-derived growth factor and other mitogenic factors that may promote the healing of chondral injuries. However, no clinical studies have proven the efficacy of platelet-rich-plasma injection for focal chondral injuries

II Whole-Tissue Transplantation

Autologous Osteochondral Transplantation [mosaicplasty, OATS (osteoarticular transfer system]

*Is an effective method

*Involves transplantation of multiple small cylindrical autogenous osteochondral plugs harvested from the less weightbearing periphery of the articular surface of the femoral condyle and transferred to create a congruent and durable resurfaced area in the defect

The limitations of autologous osteochondral mosaicplasty include donor site morbidity and a limited availability of graft that can be harvested from the patellofemoral joint

*Other potential limitations include differences in orientation, thickness, and mechanical properties between donor and recipient cartilage as well as graft subsidence at the surface with postoperative weight-bearing.

In addition, absence of fill and the potential dead space between cylindrical grafts may limit the quality and integrity of the repair.

*A MRI analysis demonstrated a failure of chondral integration, although there was good osseous integration of the subchondral bone

*Larger grafts are associated with greater donor site morbidity. [>8 mm

The effect of surface plug incongruity on articular surface contact pressures : study demonstrated that flush or slightly sunk grafts could restore contact pressures
Grafts seated 0.5 to 1 mm proud relative to the adjacent surface resulted in a 50% increase in mean contact pressures

Using a planar model for mosaicplasty, they demonstrated that approximately one-third of the mosaicplasty surface was nonviable (secondary to the 24% rate of marginal zone cell death
The outcomes of autologous mosaicplasty for symptomatic chondral defects have been encouraging
Outerbridge grade-III or IV chondral lesions58 and reported good-to-excellent results for 92% of femoral lesions, 87% of tibial lesions, and 79% of patellofemoral lesions
The rate of donor site morbiditywas 3%.
Magnetic resonance imaging revealed excellent fill and congruency of <1 mm without fissuring or delamination in 84% of the cases.
The efficacy of mosaicplasty has been compared with that of autologous chondrocyte implantation in some series. Two randomized, prospective studies comparing mosaicplasty with autologous chondrocyte implantation demonstrated a 90% rate of good-to-excellent results in the autologous osteochondral transplantation group and more rapid improvement with osteochondral autologous transplantation t

Osteochondral Allograft Transplantation

Osteochondral allograft transplantation is a cartilage resurfacing procedure that involves transplantation of a cadaver graft consisting of intact, viable articular cartilage and its underlying subchondral bone into the defect.
The size, depth, and location of the defect are all critical factors in the tailoring of the donor graft.
Advantages to the use of osteochondral allografts
1.The ability to achieve precise surface architecture,
2. immediate transplantation of viable hyaline cartilage as a single-stage procedure,
3. The potential to replace large defects or even hemicondyles, and no donor site morbidity.
Use of a large dowel osteochondral transplant in this capacity eliminates the dead space that is encountered in mosaicplasty.

Limitations of osteochondral allografting include limited graft availability, high cost, risk of immunological rejection, possible incomplete graft incorporation, potential for disease transmission, and the technically demanding aspects of machining and sizing of the allograft.

Fresh Allografts

Fresh osteochondral allografts are typically utilized, as freezing and cryopreservation have both been shown to decrease chondrocyte viability.

Traditionally, grafts have been harvested, stored in lactated Ringer solution at 4ºC, and transplanted within one week.

Recently, there has been a shift toward allograft storage in culture medium. At fourteen days, specimens stored in lactated Ringer solution demonstrated an 80% rate of chondrocyte viability compared with a 91% rate for those stored in culture medium. This is particularly important in the setting of modern tissue-banking procedures for microbiological screening and recipient matching, which have necessitated prolonged periods of storage prior to implantation.

A number of studies have confirmed the long-term survival of donor chondrocytes after transplantation. Hyaline cartilage is a relatively immunoprivileged tissue with an Avascular matrix that shields donor chondrocytes from the host immune reaction.

Cryopreserved Allografts

Cryopreservation involves rate-controlled freezing of specimens in a nutrient-rich, cryoprotectant medium (glycerol or dimethyl sulfoxide) to minimize cellular freezing and maintain cell viability. Recently, Gole et al. found a 77% rate of chondrocyte viability at one year

Fresh-Frozen Allografts

Fresh-frozen preservation of allografts offers the advantages of reduced immunogenicity and decreased disease transmission at the expense of reduced chondrocyte viability.

The process of deep freezing to 280ºC destroys the viability of all articular cartilage cells within the graft

Autologous Chondrocyte Implantation

Is an innovative, novel technique to restore cartilage cells into full-thickness chondral defects. The primary theoretical advantage of autologous chondrocyte implantation is the development of hyaline-like cartilage rather than fibrocartilage in the defect, presumably leading to better long-term outcomes and longevity of the healing tissue.
Limitations.
It involves a minimum of two operations, one for tissue harvest and the other for cell implantation. Furthermore, autologous chondrocyte implantation is technically demanding, and complications related to the periosteal graft

Matrix-Associated Chondrocyte Implantation
Although chondrocytes are harvested in a fashion identical to that used for the autologous chondrocyte implantation procedure, matrix-associated chondrocyte implantation minimizes donor site morbidity by avoiding the harvest and implantation of a periosteal flap and prevents dedifferentiation of chondrocytes during the culturing process.

Hyaluronan-Based Scaffolds
The results of implantation of hyaluronan-based scaffolds seeded with autologous chondrocytes to treat chondral defects have been encouraging.

In conclusion, the management of articular cartilage lesions of the knee is a challenging problem for orthopaedic surgeons.
While a number of surgical approaches have been described, it remains difficult to compare the efficacy of these techniques because of a paucity of well-designed randomized controlled trials in the literature
The current evidence, based primarily on large case series, suggests that bone marrow stimulation procedures and whole-tissue transplantation of allografts or autografts can achieve favorable outcomes when used for the management of focal chondral defects of the knee.

III. ATYPICAL CORONAL OR SAGITTAL Z RUPTURES OF ACHILLES TENDON: A report of 4 cases. V.S.Pai, Neil Patel FRCS

Abstract

A typical rupture of Achilles tendon occurs as a complete rupture about 4 to 6 cm proximal to its insertion to calcaneum. Authors describe four cases of atypical “z” rupture of the Achilles tendon. In two, the Z rupture was in the coronal plane and other two in the sagittal plane. All four cases were treated by open repair.

KEY WORDS Achilles rupture, Z rupture

INTRODUCTION

Spontaneous rupture of the Achilles tendon has been associated with a multitude of disorders such as inflammatory and autoimmune conditions, corticosteroid injection, fluoroquinolones. However, in the majority of cases these factors are not present and the main predisposing factor appears to be age related collagen degeneration (1). Typically an Achilles tendon rupture occurs 4 to 6 cms above the insertion into calcaneus. The major blood supply is through the mesotendon, the richest supply being the anterior mesentery. With age this blood supply has shown to be reduced (2). The cause of rupture is probably a combination of relatively hypovascular area and repetitive microtrauma that causes an inflammatory reparative process that is unable to keep up with the stresses. A mechanical overload then completes the rupture.

An atypical tear may sometimes be seen, caused by a variable torsion in the Achilles tendon together with sudden asynchronous mechanical overload. When this happens, it causes an atypical rupture with a long Z rupture in the coronal or sagittal plane. The authors report four such cases and discuss clinical findings, pathogenesis, operative findings and treatment. To our knowledge, such cases have previously been reported only in the non-English literature (3

CASE REPORT

Case 1: An otherwise fit and healthy 32-year-old Caucasian veterinary orthopaedic surgeon presented with acute rupture of the Achilles in the right leg. He felt a pop while he was trying to “push off” in a game of indoor cricket. He complained of swelling, severe pain and muscle spasm in the lower half of his leg. Clinical examination revealed diffuse swelling and tenderness over the distal half of the calf. About five centimeters proximal to the insertion of the tendon, there was a palpable defect with loss of the outline of the tendoachilles. Thomson’s test was positive and painful. At the time of surgical exploration, a “Z shaped tear” in the sagittal plane was seen (Fig 1) from about 4 cm proximal to the insertion to the musculotendinous junction. It was found that the proximal part of the tendon was rolled up, lying superficial to the muscle belly. The ruptured tendon was repaired (side to side) with a nonabsorbable suture material (Ethibond 2) utilizing multiple interrupted mattress sutures.(Fig 2)

Postoperatively, a below knee cast was applied in 30° of equinus. At 2 weeks, the cast and sutures were removed and the patient was placed in an equinus cast for a further 3 weeks. At 5 weeks, he was allowed into a Range-Of-Movement (ROM) orthosis, with dorsiflexion set at 0 degree, and mobilized touch weight bearing. He was allowed to fully weight bear at 10 weeks. The patient was able to stand on his toes by 16 weeks and was able resume all pre-injury activity by 6 months. Follow up at four years revealed no further problems.

Three other patients were managed in a similar way (Table 1). All were male, aged about forty, with a similar mechanism of injury. One had a Z sagittal tear like case 1; the other two had a coronal Z tear. With regards to the coronal tear, the proximal tear occurred in the superficial fibers of the tendon at the musculotendinous junction and the distal part of the “Z” was found near the tendon insertion to calcaneum with rupture of anterior fibres of the tendon. A vertical tear in tear in the coronal plane connected these two horizontal limbs. They were repaired front to back with interrupted sutures. All these patients made an excellent to good recovery with a return to normal activity.

Discussion

The Gastrocnemius component of the Achilles tendon begins as a broad aponeurosis from the deep (anterior) surface of the muscle bellies. As the tendon proceeds distally, the Gastrocnemius fibers converge and rotate toward the lateral aspect of the calcaneus. The soleus portion is thicker and begins as a broad aponeurosis superficial to the muscle. Soleus fibers converge and descend in a spiral course, making up the medial aspect of the tendon’s insertion. The Gastrocnemius component of the tendon, which originates on the femur, crosses the knee, ankle, and subtalar joints while its counterpart traverses the ankle and subtalar joints only. (4)

The soleus muscle begins contracting shortly after heel contact, continues through midstance, and ends shortly after heel lift. The Gastrocnemius contracts during midstance and half way into the propulsion phase. As a result of these two forces, the stability of the foot is maintained throughout the stance phase. More recently, Arndt et al (5) showed that the Achilles tendon can be subjected to non-uniform stresses through modifications of individual muscle contributions. A healthy tendon may rupture after a violent muscular strain in the presence of certain functional anatomical conditions (6). An injury, therefore, can be produced by a discrepancy in individual muscle forces ie., asynchronous contraction of various components of the triceps surae may explain the pathogenesis of different types of atypical ruptures. A coronal Z rupture probably occurs when both Gastrocnemi contract violently with a relaxed soleus. An asynchronous contraction of two gastrocnemi may be responsible for a sagittal rupture..

In a recent cadaveric study, Van Gils (7) confirmed existence of torsion of Achilles tendon. They observed variation in the tendon torsion, with a range of 11 to 65 degrees and this may be partly responsible for various types of ruptures. It has been hypothesized that the torsion may increase the tendon's strength during weight bearing and prevents rupture (8). Without torsion, during movements of the ankle and subtalar joint, the tendon may be subjected to undue tension .

Literature is full of articles on the various methods of treatment of Achilles tendon (9,10,11,12,13) but atypical tears are rarely described (3,14). It is our opinion that the rupture starts at the typical site with a tear of the lateral fibers in a sagittal "Z" and anterior fibres in the coronal "Z". It then extends vertically up in a coronal or sagittal plane to the musculotendinous junction and finally transversely or superficially at the musculotendinous junction. It is possible that it may stop at any stage and present clinically as an incomplete rupture.

Although clinically, these lesions mimic a typical rupture, these patients have more pain and tenderness at the musculotendinous junction. It is possible to recognize these lesions by Ultrasound or MRI, but it is not our policy to perform these investigations routinely in a case of Achilles rupture.

There is continuing controversy in the literature about the best method of treatment of Achilles rupture (15,16,17). In the active patient who requires the strongest result and wishes to minimize the incidence of re-rupture, surgery would seem to be the treatment of choice. The exact incidence of atypical rupture is not known as our policy is to operate only in active patients when the Thompson's test is positive. These reported four cases of atypical Z rupture were noted among 104 Achilles tendon rupture operated on by the senior author .

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Legend

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TABLE 1 CLINICAL DETAILS OF FOUR PATIENTS WITH ATYPICAL RUPTURE

Patent	Age/Sex	H/Otrauma	Type of tear	Treatment	Results
1	43/M	Indoor cricket	Calf Z Sagittal	Side to side	Exc
2	42/M	Netball	Z sagittal	Side to side	Exc
3.	37/M	Pushing	Z coronal	Front to back	Exc
4	47/M	Rugby	Z Coronal	Front to back	Good

V. Notes: Flexor tendon injury

TENDON INJURY OF THE HAND

HISTORY

Bunnell [1918]	No man's land for Zone II and suggested no repair as results were poor
Verdan [1960]	Some man's land for Zone II. Expert surgeon can operate
Kleinert, Kessler and Gelberman	Improved knowledge of Kinesiology, Biological repair

BASIC SCIENCE

Blood supply of the tendon

1. The Vincular system is supplied by the transverse communicating branches of the common digital artery.

   Regional circulation

   Dorsal is more than volar surface

   Vincula of FDP at insertion of FDS at PIP

2. Main Nutrition is derived from the synovial fluid

Pulley system

Always preserve A2 and A4 pulley

Loss of these Pulleys causes weakness of grip

This is due to the fact that the loss pulley increases the distance a tendon from the axis of the joint which leads to decrease motion for a given muscle contraction

Kinetics

Forces on flexor tendon

Passive flexion	4 N
Active Flexion without resistance	10N

Moderately resisted exercise	17N
Strong grasps	70N

Histology of flexor Tendon repair

Early mobilization	Intrinsic repair predominates [tenocytes]
Immobilization	Extrinsic repair predominates [surrounding cells]
Proliferative [2-3 Wk]	Mesenchymal differentiation
	[Collagen perpendicular orientation]
	TGF level peaks [increases adhesion]
Early Remodel [3-4 wk]	Longitudinal Orientation of collagen and decrease in cells
Complete Remodel [20th wk]	

Tendon Strength

Weakest	at 6 days
Fairly strong	at 6 weeks
Maximal strength	at 6 Months

Requirement

1. Early-motion protocols resulted in a progressively greater ultimate tensile load

2. Tension at the repair site, motion and tension are needed to stimulate tenocyte development and increase collagen amount

3. Minimal gap formation at the repair site: Gap formation as a result of cyclic loading before tendon failure is seen routinely after flexor tendon repair. In their canine study, repair gaps >3 mm did not gain stiffness from 10 to 42 days, but gaps <3 mm had a 320% increase in stiffness and a 90% increase in strength at 42 days

How to prevent adhesions?

Early postoperative motion protocols
Preservation of sheath and pulley components
Partial FDS resection
Atraumatic handling

Resection of all or part of the FDS tendon has been suggested as a method of decreasing gliding resistance of the FDP within the sheath. However, this technique was initially dismissed because a considerable portion of the FDP blood supply is provided by capillaries emanating from the FDS tendon.

ZONE [VERDAN]

I	Midphalanx of middle phalanx to the insertion of FDP
II	From MPJ [A1 pulley] to Midphalanx of Middle finger
III	Distal margin of Flexor retinaculum to A1 pulley
IV	Proximal wrist crease to distal margin of Flexor retinaculum
V	Proximal to Proximal wrist crease

THUMB

Five thumb flexor zones are described

Zone 5 Proximal to Carpal Tunnel

Zone 4 In the carpal tunnel.

Zone 3 Thenar zone [to MPJ]|

Zone 2 Pulley zone [A1 + long oblique pulley A3 + A2

Zone 1 Between A2 and insertion of FPL

CLINICAL

History of trauma

Attitude of the finger [Finger is held in extension at PIP and DIP]

Ultra sound examination in selected cases

PRINCIPLES OF TENDON SURGERY

Identify: Tendons and nerves [based on location and appearance]

Proper match and repair

Meticulous repair of FDS first and then FDP [Repair both]

It is important maintain proper tension in the tendon. This is particularly important for the FDP. The short tether syndrome (quadrigia efffect) is secondary due to tendon advancement.

Stable bone fixation techniques permit immediate motion.

When required, repair the volar plate

Repair flexor sheath has not shown necessary

Pulley system: A2 and A4 repaired with 6-0 Nylon or reconstruct

Verdan's zone and surgical outcome

Zone	Meticulous	Result	N-V/Lumbrical
Zone V	++	++++	Nerve damage
Zone IV	++++	+++	+
Zone III	++++	++++	Lumbrical plus problem
Zone II	++++++	++	Digital nerve deficit
Zone I	++++	+++++	-

Zone I

Avoid advancement of FDP

Advancement causes quadrigia effect

Options: Anchoring stitch

Through bone over a button

When distal stump 1.5 cm, end to end repair.

Zone II

Bunnel's No man's Land

Fibro-osseous tunnel

Floor Bone, periosteum,

Roof Fibrous sheath: Annular and Cruciate pulleys

Contents FDS becomes two flat slips and hug FDP.

FDS then form chiasm of Camper at PIP joint

Surgical Technique

When distal stump is adequate, end to end repair of the tendon is indicated. When distal stump is short, tendon is repaired through the bone. Alternative: Mini suture anchors

Primary repair The "golden period" of the first 6 hours

More than 6 hours, the wound is potentially contaminated

Delayed repair: delayed for 2 to 14 days

Skin incision

Avoid straight incision

Brunner's incision

Retrieval of proximal tendon

Milking technique [Kleinert's]

Fishing with forceps is dangerous

Pediatric feeding tube [Pennington] is used to retrieve the tendon

Extend skin incision and open the sheath intervening skin bridge

Tendon repair

Repair the FDS slips: Horizontal mattress using 5-0 nylon.

Repair the FDP: Tajima technique/Adelaide 4 strand

with 3 0 ethilon

Core stitch >75% of strength, 3-4 '0' braided ethibond

Circumferential stitch up to 40% with 6'0' proline

Stitch should be in Volar than dorsal surface

Running stitch

A 5-0 nylon epitendinous repair on the palmar aspect

Continuous running stitch begins1-2 mm from the edge;

Begin on the dorsal and return to the palmar side

Advantages

25% of strength

Prevents gaping of the tendon

Prevent catching of the tendon to the sheath

Strength of the suture depends on

1.Strength: Depends on number of strands

[6 strands three times; 4 strand is 2 times that of 2 strand]

2. Tension across the strands

Equal tension across all strands is required;

Proper tension

2. Number of knots

Single knot is stronger than double knots

3. Gap formation

Minimize gap formation, running stitch should be applied

4. Do not transfix the tendon and sheath

5. Do not advance or retract tendon

Sheath Repair

Recently it has been advocated but its use is optional.

Theoretically, the barrier for formation of adhesions

Provides quicker return of synovial nutrition

Outcome of zone II tendon repair

Duran	Bunell 2 strand	Duran regime	16% re-rupture
Strickland	Kessler’s	Duran	4%
Gault	Kessler’s	Klienert’s	4%
Savage	6 strand	Active	4%
Harris	Kessler’s	Active	6%

SPECIAL SITUATIONS

1.Partial Rupture

Zones 1 and 2 Repair all partial lacerations

Zone 3, 4, 5 Lacerations of <25% best left unrepaired.

50% of tear always repair

2. Segmental tendon laceration

Segmental cut Repair it similar like any tendon laceration

Segmental is lost

Zone 5,4,3 Segmental tendon graft (using palmaris)

Zone 1, 2 Graft the entire distal segment

3. Frayed tendon

Severely frayed Tendons : Debride and treat like segmental loss

For severely chewed up tendon in 1 and 2:Two stage tendon grafts.

4. Missed FDP laceration

Early detection The cut tendon is repaired.

Late detection Options are

1. Delayed repair
2. Tendon graft

3. Single stage flexor tendon grafting

4.Two-stage grafting

I stage	Silicon rod
II Stage	Replaces the tendon Palmaris Longus

5. Stabilize DIP (Tenodesis/Arthrodesis)

5. Pulley reconstruction

Use the residual base of the annular ligaments

With a strip of tendon [PL]

Crisscross the tendon over the rod or tendon

It should be tight enough to eliminate bowstringing and loose enough to allow gliding during passive range of motion.

Presentation of acute pulley rupture

Rock climbers

Presenting with swelling over the Volar aspect of PIP .

Clinically FDP and FDS working well.

Suspect: Acute rupture of A2 or A3 pulley. Treatment: reconstruction of the first pulley

6. Tendon adhesions

Adhesion or block: Active ROM is less than the passive ROM

Tenolysis is indicated

Timing: 4 months after repair [no improvement]

Results: Directly proportional to the extent of the adhesions and physio input.

Tenolysis: Under regional block, Sharp dissection to release adhesions, check gliding of the tendon

Reconstruct pulleys when required, early mobilization

Tenolysis should not be considered until the soft tissues have reached a state of equilibrium, with supple skin and subcutaneous tissues.

To achieve a good result, the digit must have minimal joint contractures and near-normal passive ROM. Most surgeons recommend waiting for 3 to 6 months

7. Unusual problems

a. Trapping of the FDP in Zone II repair

Flexion occurs only at the proximal interphalangeal joint. This is due to FDP tendon is trapped by FDS tendon. Treatment is removal one slip of the FDS.

b. The Lumbrical Plus Hand

Attempt to Flex at MP joint, increases in extension of PIP and DIP joints. This is due to long graft or lax graft ie., more stretching of Lumbrical. Treatment is release of intrinsic release [Littler's procedure].

c. Quadrigia effect

Quadrigia is the inability of uninjured fingers of the same hand to obtain full flexion. It manifests as a weak grasp on physical examination. This complication is caused by functional shortening of the FDP tendon.

When Quadrigia occurs, tenolysis of the proximal adhesions or transection of the shortened tendon will release the uninjured profundus.

8.Pediatric problems

Poorer outcomes in younger than 5 years.

When zone II involvement, an above elbow cast for 4 weeks is recommended

POST-OPERATIVE PHYSIOTHERAPY

"Delicate balance between protection and mobilization during the early postoperative weeks is essential"

Types

1. Klienert's Splint

Active extension and passive flexion

Position in the splint: Wrist 30° Plantar flexion

Metacarpophalangeal joints in 70° flexion

Interphalangeal joint 0º

2.Brooke Army splint

Modification of Klienert's splint

Here there is a palmar bar pulley

This is to improve flexion in the DIP joint

3.Duran's Dorsal Blocking splint

Controlled passive mobilization of interphalangeal joints

PIP in Flexion, flex and extend the DIP joints

DIP in extension, the PIP is flexed and extended

4.Immobilization

Bad. Increases stiffness.

COMPLICATIONS OF TENDON SURGERY

1. Infection
2. Adhesions - prevented by early passive ROM
3. Joint contractures - too tight repair or from prolonged splintage
4. Bow stringing secondary to damaged pulleys
5. Re-rupture 5-10%

FACTORS THAT PREDISPOSE TENDON RE-RUPTURE

Inadequate suture material

Poor surgical technique

Aggressive therapy

Early termination of postoperative splinting.

Patient noncompliance

attempting strong grasp