Syndesmosis injuries may be acute and chronic. They may present as an isolated injury or most commonly, associated with an ankle fracture. Isolated ligamentous injuries of the syndesmosis are misdiagnosed in up to 20%.

Ankle fracture is the most frequently operated injury by an orthopedic surgeon and has recently received more attention related to increased awareness of potential long term complications, such as malunion and arthritis. Syndesmosis area includes bony as well as ligaments component. The anterior inferior tibiofibular ligament has recently become focus of attention. Fifteen years ago it used to be mentioned associated to ankle impingement, but now it is recognized as a paramount ligament for syndesmosis anatomical reduction. The anterior inferior tibiofibular ligament (AITFL) is one of the four ligaments of the distal tibiofibular syndesmosis.

The incidence of AITFL seems to be higher that previously reporter. Birnie shows patients who underwent surgery due to a malleolar ankle fracture, a high incidence (25.8%) of AITFL avulsion fractures was observed in comparison with the previous literature.

Introduction:

Syndesmosis injuries may be acute and chronic. They may present as an isolated injury or most commonly, associated with an ankle fracture. Isolated ligamentous injuries of the syndesmosis are misdiagnosed in up to 20%.

Ankle fracture is the most frequently operated injury by an orthopedic surgeon and has recently received more attention related to increased awareness of potential long term complications, such as malunion and arthritis.

Syndesmosis area includes bony as well as ligaments component. The anterior inferior tibiofibular ligament has recently become focus of attention. Fifteen years ago it used to be mentioned associated to ankle impingement, but now it is recognized as a paramount ligament for syndesmosis anatomical reduction. The anterior inferior tibiofibular ligament (AITFL) is one of the four ligaments of the distal tibiofibular syndesmosis.

The incidence of AITFL seems to be higher that previously reporter. Birnie shows patients who underwent surgery due to a malleolar ankle fracture, a high incidence (25.8%) of AITFL avulsion fractures was observed in comparison with the previous literature.

One of the most common malunion has been demonstrated by post op CT scans at the syndesmosis area. Failure to achieve anatomical reduction has been directly related to poor clinical outcome. Some authors show more than 50% of malrotation (>5º) and anterior or posterior translation (>2mm) should be considered mal reduction.

1. How to make the diagnosis of syndesmosis injury:

Diagnosis can be quite obvious in preoperative weight bearing rays showing less than 1 mm tibiofibular overlap. It is useful to have comparative contralateral X-rays because there may be subtle changes easier to identify comparing with the uninjured side.

In case of doubt you may ask for stress X-rays or just a simple AP ankle view with lateral stress (the foot hanging at the edge of the table). MRI may be useful for ligamentous injuries as well as for associated injuries. Weight bearing CT scan is useful to detect mild asymmetric changes when comparing with the contralateral side, but unfortunately is not worldwide available.

Intraoperatively syndesmosis should be tested aggressively looking for instability using any instrument strong enough to make sure it does not move under stress.
Nowadays arthroscopy is considered the gold standard for diagnosing syndesmotic instability, superior to any other physical examination or diagnostic imaging method.3

Ankle arthroscopy enables diagnosis of syndesmosis instability, combined to joint assessment or surgery. The syndesmosis is judged unstable as of 2 mm diastasis, which is commonly tested by introducing an arthroscopic palpation hook into the tibiofibular joint line, showing good correlation with MRI. There needs to be a 3 ligaments (AITFL, PITFL, IOM) lesion for such fibular translation.

In a study published in 2017 Guyton concludes that the use of a spherical probe placed into the tibiofibular space during manual external rotation of the ankle provided an objective measure of syndesmotic instability. Passage of a 2.5 mm probe indicated some disruption of the syndesmosis, but the test had poor negative predictive value. Passage of a 3.0-mm spherical probe indicated very high likelihood of disruption of both the AITFL and the IOL.4

Most authors seem to agree that 2 - 3 mm of syndesmotic diastasis during arthroscopy proves instability.1

2. How to achieve anatomical reduction:
Since anatomical reduction is mandatory for good clinical results, it is recommended to be extremely accurate to obtain reduction easily and hopefully without the need of a strong clamp. If the clamp is needed it should reduce the syndesmosis with mild pressure. Instead it is even better we prefer if the to close the gap closes by itself and you hold the ing tibia and fibula together with one hand. If the fibula and the posterior malleolus are anatomically reduced it typically comes into its position easily. If not, it is recommended to revise length and rotation of the fibula as well as the perfect reduction of the posterior malleolus.

So it is always necessary to have a specific clamp to use when you consider it necessary. It should be like GMReis clamp, big and round enough to achieve proper grasp without endangering soft tissues.
3. How to fix the syndesmosis:

If screw are used, should they be removed?

It was initially recommended to remove screws between 6 - 8 weeks, but evidence came up showing increased failure with reopening of the syndesmosis. It was then recommended not to remove screws before 3 - 5 months but at that moment of the recovery most patients had a progressive recovery and did not want to go back for surgery. X-rays typically show that the screw is broken at the syndesmosis level or a windshield effect was observed at the tibia. This means that the syndesmosis recovered at least part of its motion by itself. We have occasionally seen patients that around 4 months after surgery they may experience permanent restriction of dorsiflexion that seem to go away when the screw loosens or it may need to be removed.

Rigid or flexible fixation

Flexible fixation is one of the most innovative advances to fix syndesmosis injuries. To have a method of fixation that does not provide rigidity but is stable at the same time and does not need to be removed is very appealing.

Over the years several studies have shown that this type of fixation is at least as stable as a screw in biomechanical studies. In clinical trials it does not have more failures than rigid fixation and interestingly is has shown that anatomical reduction is more likely to be achieved and patients seem to feel better.

These findings make sense if you think that flexible fixation brings fibula into the incisura fibularis of the tibia smoothly, decreasing the risk of malrotation and translation commonly seen in post op CT scans after screw fixation. Since this type of fixation maintains at least part of the physiological motion of the joint it may explain why patients feel better and seem to recover sooner. The knotless fixation is not prominent so removal is unlikely to be needed.

Where to put fixation:

Syndesmosis fixation is recommended to be just above the syndesmosis. This is why in the literature you will generally read: between 2 - 4 cm over the ankle joint line. If fixation is at the level of the syndesmosis, the likelihood of stiffness and ossification is theoretically increased.

Fig.: CT scan showing malreduction of syndesmosis with a screw.

Fig.: X-ray demonstration anatomical fixation of the fibular and syndesmotics reduction with two screws.

Fig.: Syndesmosis flexible fixation with GMReis Expert Knotless (left) and rigid fixation with screw (right).

Fig.: CT scan showing malreduction of syndesmosis with a screw.
**Should every fibular fracture be fixed before syndesmosis reduction**

Although, in order to obtain anatomical reduction, some authors fix even the more proximal fibular fractures, this is technically demanding and may increase soft tissue damage as well as neuropaxia of the fibular nerve.

Since anatomical reduction of the length and rotation of the fibula is paramount, most surgeons recommend to fix fractures that are all the way up to half of the length of the fibula. If fracture is more proximal than this, traction with a clamp and reduction of fibular length and rotation may be necessary.

**When should I use more than one fixation:**

There is just poor level of evidence to answer this question but most surgeons would recommend to use two flexible fixations if: patient is heavy, and athlete, or if there is significant instability. This is typically the case for proximal fractures and also when post-ant instability of the fibula is evident while reducing and fixing the fracture.

**Can fixation be isolated without a plate?**

Again, there is not solid evidence, but since fibular and even tibial fractures have seen when and isolated flexible fixation has been used most author would add a plate in osteoporosis and when using double fixation (for severe instability as discussed in the previously).

**Repair ATFL?**

This consideration has recently been suggested when performing open reduction and fixation of the fibula; and there is significant instability this may be controlled repairing the ATFL. Since a simple suture would probably not be strong enough, a tape with knotless anchors in its isometric position is an easy way to solve the problem.

**What if there is just and avulsion fracture of AITFL?**

Reduction and fixation of AITFL avulsion fracture obviated the need for syndesmotic screw fixation in more than 80% of patients with AITFL avulsion fracture and syndesmotic instability.
Tibiofibular fixation using Expert Knotless for flexible fixation implants is an optional method for the surgical treatment of syndesmotic injuries. Although good clinical outcomes have been reported, inadequate stability between the tibia and fibula has also been documented. Thus, flexible fixation is not considered the reference standard. For surgical treatment of lateral ligament injuries of the ankle, good treatment outcomes have also been reported with ILA - Internal Ligament Augmentation using nonabsorbable suture tape. Ligament augmentation tape with flexible fixation could also be promising for improved treatment outcomes in syndesmotic injuries. Teramoto describes flexible fixation together with mini-open anterior inferior tibiobibular ligament augmentation using suture tape for treatment of syndesmotic injuries. Regauer recommends to add a tape to repair the AITFL.

Regauer recommends to add a tape to repair the AITFL.

5. Post op protocol
This has evolved from a very strict 6 weeks in a non weight-bearing cast into a more functional rehabilitation. Anyway, most surgeons would still prefer at least 3 weeks non weight-bearing in a removable boot. In our experience the compliant patient seems to control himself so we allow them to put weight as tolerated in a removable boot. They are typically unable to put full weight until the same 3 weeks period, but rehabilitation can be started as soon as soft tissues are in good conditions and pain is under control.

Summary
Flexible fixation seem to be preferable to screws. Complementary ligament reconstruction seems logical when ligament healing is not to be hoped for, but reported series have been insufficient. Isolated flexible fixation stabilization, including in both subacute and chronic cases, with synovectomy and/or freshening may be sufficient to achieve mechanical stabilization. Assessment of this technique, and of multiligament stabilization, will require large enough cohorts and more than 5 years follow-up.

Although full understanding and solution of every ankle fracture is not yet achieved, there has been significant improvement in the last few years with a clear trend into improving diagnosis, anatomical reduction and also into flexible fixation. The final role of AITFL is yet to be determined but it should be considered without doubts.
References:


9. None.


17. Malreduction of syndesmotic injury associated with angular ankle fracture can be avoided using Webers three indexes in the mortise view.


19. Acute and Chronic Syndesmotic injury associated with angular ankle fracture can be avoided using Webers three indexes in the mortise view.


23. None.


27. None.

28. None.

29. None.

30. None.

31. None.

32. None.

33. None.

34. None.

35. None.

36. None.

37. None.

38. None.

39. None.

40. None.

41. None.

42. None.

43. None.

44. None.

45. None.

46. None.

47. None.

48. None.

49. None.

50. None.