The Reversal

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I have just finished reading Michael Connolly's new book, *The Reversal*. Harry Bosch and Mickey Haller are working on an old case; a case that is trickier than they first assumed. They solve the case, along a winding road. I came to think about the treatment of ACL injuries—especially when it comes to ACL reconstruction—which is also a tricky case, and an old one as well. In fact, it is so tricky that we have not solved it—not yet anyway. Reversal, what are we talking about now? Is there possibly a completely new treatment for ACL injuries? Perhaps, we do not need to operate on ACL injuries any more? Is that a possibility? Hardly, I would go so far as to say. Instead, I guess that we will see new advances in the diagnostic evaluation and treatment of ACL injuries, whether they are surgical or non-surgical. During the last few years, we have seen several important improvements in the treatment of ACL injuries. The most important improvements are related to a better understanding of the surgical technique. This is where 'the reversal' comes into play. Several terms that we have felt to be more or less necessary, like isometry, o'clock reference and notch plasty, are probably just descriptions of past times; they have come and have now gone (at least, more or less). Instead, we have reversed; we have new terms and a new understanding of how to perform an ACL reconstruction. Most important is the anatomical way of thinking. One important issue is the double-bundle technique, but we should make it clear that double-bundle ACL reconstruction is not necessarily the same as anatomical reconstruction. Double bundle can still

be done in a non-anatomical fashion. Single-bundle ACL reconstruction can be done anatomically.

A second issue that has been discussed increasingly is understanding each knee and each patient. The injuries differ, the anatomy differs and the individual risk profile and requirements differ. This is probably equally important. So, correct anatomical restoration and individual understanding are most probably the key factors. In this issue of the journal, Siebold [11] has raised the point that recent clinical studies have shown mixed outcomes when it comes to double-bundle reconstruction. Although the concept of anatomical double-bundle ACL reconstruction is at least theoretically superior in terms of anatomical and biomechanical studies [1–7, 9, 12, 13, 16, 17], the differences in functional outcome are not obvious in many studies [8, 10, 14, 15]. It is therefore possible to question the benefit of the technically more complicated double-bundle reconstruction. Siebold [11] also concludes that a so-called anatomical single-bundle reconstruction is performed by placing the bone tunnels in the centre of the tibial and femoral footprints. This may, however, not be entirely correct, as the bone tunnels are only related to the size of the graft and not the size of the knee. The bone tunnels may therefore only partially cover the natural insertion site area. In the above-mentioned study, the concept of an 'insertion site table' is addressed. This concept is related to guidelines for both single-bundle and double-bundle anatomical ACL reconstruction. The insertion site table takes account of 'short insertion', 'intermediate insertion' and 'long insertion'.

The short insertion site length is defined as a tibia ACL insertion of 8–13 mm, and it can be restored to more than 95% by an individually matched single-bundle reconstruction. The individual matching also relates to whether hamstrings, bone-patella tendon-bone or quadriceps grafts

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are to be preferred. The insertion site table also takes account of the drill angles in the tibia.

The intermediate insertion site length is defined as 14–15 mm. This is more critical and requires a large single-bundle bone tunnel. This must be combined with smaller drill angles, creating a larger oval at the entrance to the joint. In fact, a 15-mm long insertion might be the shortest site length, which is suitable for a double-bundle reconstruction. In this situation, two small AM and PL bone tunnels have a significantly higher tendon-to-bone contact than an 11-mm single-bundle reconstruction. Finally, a long insertion site, defined as 16 mm or more, cannot be adequately restored by one single-bundle tunnel. In other words, when dealing with a long insertion site, there will always be a deficit of non-reconstructed insertion site. For instance, in a knee with an insertion site length of 18 mm (not uncommon in everyday practice), the coverage of the insertion site would be less than 80% using an 11-mm single-bundle reconstruction. Now, the question is ‘Is 80% or less anatomical’? Where is the limit?

This is ‘The Reversal’, i.e. the need to turn our back on and move away from old terms and understand the new ones. We need to leave transtibial femoral drilling, because we will be a long way away from anatomical restoration of the footprints using this technique. I would go so far as to claim that this technique is outdated. We need to understand each knee, we must be able to measure the insertion sites in an accurate fashion and we must learn to use this information in such a way that the ACL reconstruction leads to an optimal functional outcome. The new concept of a complete footprint restoration produces an ample opportunity to increase the insertion site area of the reconstructed ACL. This is correct anatomical thinking, and it will take us all forward. The insertion site tables are calculated in order to define drill diameters and drill angles, with a guideline on graft choice as well. The insertion site length may also clearly define the surgical indications for single-bundle versus double-bundle ACL reconstruction. The double-bundle technique is best suited in knees with a long footprint, where there will be an incomplete coverage of the footprint using the single-bundle technique. However, the double-bundle technique is not indicated in knees with smaller insertion sites.

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