

## The trade-off between stability and morbidity in reconstructive surgery



### Abstract

Traditional orthopaedic teaching has suggested that there is a 'gold standard' operation for every surgical complaint. When a novel surgical technique is proposed, it is often compared to the traditional procedure in a controlled trial to assess which is the 'superior' procedure, using global analyses of function. There has been an evolution of multiple surgical options for particular sports injuries which are difficult to separate using overall scores. This means that the traditional view of surgery needs to be reassessed for diagnoses such as anterior cruciate ligament tears, patellofemoral instability, anteroinferior glenohumeral instability, footballers' groin pain and ankle syndesmosis sprains. For all of these diagnoses, there may be multiple surgical gold standards. The operation which provides the best stability for these diagnoses is not necessarily the one with the least concurrent morbidity, best preservation of joint mobility and quickest recovery time. Depending on the sport, player position, age, level of competition, stage of playing season and patient preference, a different reconstruction procedure may be indicated in different circumstances for the same diagnosis.

Sports medicine is one of the newest medical specialties. Depending on the country it can be a stand-alone physician specialty, a primary care and/or orthopaedic subspecialty or all of the above. In the USA, there is an orthopaedic subspecialty of sports medicine, although in other countries

orthopaedic surgeons tend to subspecialise based on region (e.g. knee; shoulder; foot and ankle).

In the field of sports surgery, the majority of joint operations can be roughly divided into arthroscopic debridement procedures, which are less invasive and have a quicker recovery time and reconstructive procedures, which have a longer recovery time as they involve tissue repair. Classical reconstruction procedures include knee anterior cruciate ligament (ACL) reconstructions and shoulder reconstructions for anteroinferior instability. Arthroscopic debridement procedures (such as partial menisectomy) revolutionised sports surgery in the early 1980s with respect to rapid return to sport. Joint reconstructions had an equally revolutionary effect in that athletes who would have previously needed to retire from sport due to chronic instability were able to return to high level play after surgery.

By the late 1980s, middle third bone-patella-bone grafts had been established as the 'gold standard' for ACL reconstructions<sup>1</sup>. In a similar fashion, open Bankart repairs became the 'gold standard' for glenohumeral reconstructions<sup>2</sup>. These operations have a high success rate in terms of return to professional level sport<sup>3</sup>. Their downside is a significant post-operative morbidity and a long recovery period, which have been accepted as being preferable to instability recurrence or retirement. Since the 1990s, alternative procedures have been performed seeking the same results in terms of resolution of instability but with a more rapid recovery time and less associated surgical morbidity. The uptake and preference for the more contemporary procedures has varied from surgeon to surgeon, with the concept of a single 'gold standard' harder to justify.

## Management of ACL tears

The ACL reconstruction is the definitive sports orthopaedic operation and one which has certainly led to more publications than any other reconstructive procedure. Despite hundreds and thousands of publications regarding surgery, there are a vast number of techniques for ACL surgery with very little proof of superiority of one technique over another<sup>4</sup>. An exception to this may be that recent publications are reporting superiority in outcomes for femoral tunnels which are drilled through a medial portal compared to using a transtibial approach<sup>5</sup>. Now that the Scandinavian countries have ACL registers<sup>6</sup>, real-world outcomes related to surgical technique differences will be better uncovered.

The most commonly-used grafts for ACL reconstructions worldwide are autologous mid-third patellar tendon with bone blocks (BTB) and autologous hamstring tendons (HT)<sup>1,7</sup>. Many papers have compared outcomes between the two and most meta-analyses find that overall clinic outcomes are very similar<sup>4</sup>, with the BTB grafts leading to slightly greater stability and the HT grafts leading to slightly less morbidity. Nevertheless there is a worldwide trend (which is more pronounced in Australia and Scandinavia than the USA<sup>7</sup>) towards HT grafts over BTB grafts, as more patients prefer low morbidity over greater stability.

Until recently in Australia, it had been accepted that an ACL reconstruction took a minimum of 6–12 months to recover from. Two historical false starts in trying to reduce the recovery time had entrenched this belief. Artificial grafts had been tried, generally without success, in the late 1980s<sup>8</sup>. Five month return (or less) after autologous graft reconstructions wasn't uncommon in the 1990s, but high profile cases such as Melbourne AFL player David Schwarz<sup>9</sup>, who had a very successful return game under four months but reruptured in his second game, has scared many doctors away from advocating early return. In the USA, allografts (cadaver grafts) have been the option of choice for reducing morbidity and speeding up recovery<sup>7</sup>. It is now felt that the quicker recovery is at a cost of reduced stability<sup>10</sup>. Despite the success of Alisa Camplin in returning to the winter Olympics within four months of an allograft ACL reconstruction, this technique has not taken on in Australia like it has in the USA.

Australia may have, however, become a pioneer country in the use of LARS ligaments for ACL reconstructions. The early published series have mainly arisen from Asia<sup>11</sup>, but Australia has been the first country where multiple professional football players have taken the LARS option. In 2010, David Rodan in the AFL and Luke Covell in the NRL have made successful in-season returns after LARS reconstructions. The first Australian players to have a LARS reconstruction, Nick Malceski, has also returned to his best form (two years post-surgery) and shown that a LARS ligament can get a good longer-term outcome. It is telling that both Malceski and Rodan took the plunge to have a LARS reconstruction having previously come back from traditional reconstructions on their respective opposite knees. The Covell history provides an example of an athlete type (late in his career and in the final year of his contract) who definitely needs a rapid-return option available. A traditional reconstruction would have meant that he needed to retire immediately after his ACL injury, whereas the LARS option meant he was able to play a good number of games in his last season.

I would be surprised if the long-term stability of LARS ligaments was able to match autologous grafts and expect they will eventually be shown to have a similar profile to allografts, although it is already clear that LARS ligaments are substantially better than the artificial ligaments of the 1980s. However, I've already been surprised at their success so far and it isn't inconceivable that they may become the graft of choice in the future. At the minimum, if we presume long-term stability results similar to allografts, an athlete needs to weigh up the stage of the season (and more importantly stage of their career) when deciding whether to take a high stability/high morbidity option or a low morbidity/quicker return option (Table 1). Even though the LARS technique is the latest trend in Australia, it is worth remembering that there are other options which can lead to a more rapid return than a traditional autograft, including allografts from cadaver, allograft from living relative and repair/conservative treatment for a partial injury.



Figure 1 – Arthroscopic ACL reconstruction

Table 1 – Factors which would affect choice of reconstructive surgical procedure

Factor to consider	Situation where stability is more important	Situation where less morbidity/rapid return is more important
Age of patient/player	Younger player	Older player
Contract status (for professional player)	Early in a multi-year contract	Last year of contract
Stage of season	Late in the season (where return at 2–4 months is not possible)	Early in the season (where return at 2–4 months would be possible)
Type of lesion	Complete rupture with secondary structures damaged	Isolated/partial lesion

### Management of shoulder instability

Shoulder instability is another common injury presentation that generally requires surgical management in contact sports. There is now a well-established continuum from rapid return through external rotation brace, arthroscopic stabilisation and open stabilisation without and with a bone graft. As the surgeon moves along the continuum, the recurrence rates for further instability episodes reduce, but the recovery time (and potential for loss of shoulder range of motion) increases. Different surgeons will have a preference for different types of management. The French often use Latarjet procedures in their rugby players as a standard part of the reconstruction<sup>12</sup>,

but in Australia we prefer more simple Bankart repairs. Perhaps though it should be athlete factors rather than surgeon preference which determine the balance of risk/benefit for each technique (Table 1). Even the staunchest advocate for early surgery in shoulder instability could not mount a serious argument that Buddy Franklin, for example, should have had shoulder stabilisation surgery mid-season in 2008 in preference to opting for non-surgical in-season treatment, which allowed him (and his team Hawthorn) to win an AFL Premiership. Perhaps the options in shoulder surgery for an AFL/NRL 26 week competition (depending on situation) might now look like something in Table 2 (see overleaf).

Table 2 – Stage of 26 week season and best management of anterior shoulder dislocation with soft tissue Bankart lesion

Stage of season	?Preferred management	Recovery time	Matches missed	Recurrence rate
Pre-season at least 6 weeks prior to start of season	Acute arthroscopic repair	4 months	<=8 matches	?15–20%
Pre-season within 6 weeks of start of season	Conservative treatment in external rotation brace	6–8 weeks	<=4 matches	?30%
Week 1 to Week 18	Standard conservative with rapid mobilisation	<=4 weeks	<=4 matches	?40–60%
Week 18 to Week 26 (team not likely to play finals)	Open shoulder reconstruction	6–8 months	Few and of little consequence	?10%
Week 18 to Week 26 (team likely to play finals)	Standard conservative treatment with rapid return to play	2–3 weeks	2 matches	?50% because of fewer matches
Post-finals having negotiated through season with ongoing symptoms	Arthroscopic shoulder reconstruction	4–6 months	None	?15%
Post-dislocation after previous failed surgery	Latarjet procedure	7–9 months	Many but career-threatening injury	?10–15%

### Management of patellofemoral instability

Patellofemoral instability presents a very similar management dilemma to glenohumeral instability. It can sometimes be good management to avoid surgery altogether, which allows relatively rapid return to sport but with a relatively high rate of re-dislocation. The surgeon can progressively increase the degree of stabilisation (lateral release, medial patellofemoral ligament repair/reconstruction<sup>13</sup>, tibial tubercle transfer) where each upgrade reduces recurrence rate but increases recovery time (and secondary quadriceps wasting). As surgeons reflect patient preference, the low morbidity options tend to be the most popular for both amateur and even professional players. However, the lower-morbidity procedures can fail and in situations where stability becomes of greater importance then there are 'belt and braces' methods to lower recurrence rates even further.

### Management of syndesmosis sprains

Management of syndesmosis injuries ('high' ankle sprains) is not as well understood as an entity, but it is established that surgical fixation is sometimes required. Many syndesmosis sprains will respond well to non-surgical treatment, but in some cases, ongoing diastasis after initial management can lead to chronic morbidity (and become a career-ending injury in professional athletes). The cut-off line between non-surgical and surgical management is therefore not easy to define. A sensible anatomical cut-off might be whether or not there is diastasis on a weightbearing X-ray. However, Table 1 reminds us that a recommendation should be based on

the whole patient rather than just the lesion. Like the other situations presented, non-surgical treatment can offer a quicker return with low morbidity. In terms of surgical management, there are now multiple options. The traditional method of syndesmosis screw fixation (which generally requires screw removal as a second procedure) has a high success rate but slow recovery rate (and incidence of post-operative stiffness). Flexible wire fixation (e.g. the 'tightrope' procedure) offers a middle ground between screw fixation and non-surgical treatment<sup>14</sup>, with a more rapid return but to date without the same proven success in correcting the instability.

### Management of chronic groin pain in footballers

If it is fair to say that the pathology in syndesmosis sprains is not completely understood, this admission would certainly apply to the entity known as athletic pubalgia (or the footballer's groin)! The pathology is potentially any or all of part bony stress lesion, part tendinopathy, part arthropathy and part instability. If that still sounds comprehensible, referred pain from the hip joints, lumbar spine, sacroiliac joints and even the prostate gland or possible infection need to be considered as part of the differential diagnosis. Depending on where you go in the world (and this refers to city and even clinic as much as country), experts can prefer either conservative treatment, minimally-invasive soft tissue procedures, more definitive soft tissue procedures and even bony procedures. General surgeons will prefer to operate from the abdomen down and orthopaedic surgeons at the level of the symphysis and below. Some surgeons prefer the one procedure so much

that it becomes eponymous (Gilmore, Lloyd, Muschaweck) whereas others will perform a multitude of different surgeries depending on the presumed pathology<sup>15</sup>. Despite the enormous grey areas, the principle espoused in this article applies to the footballer's groin. If rapid return/ongoing play is possible and highly beneficial, then conservative treatment should initially be preferred and, if surgery is required, a minimalist procedure such as an isolated adductor release<sup>3</sup> or an endoscopic hernia repair should be the preferred management. For a more protracted case then an open combined inguinal reconstruction/adductor release may be considered<sup>15</sup> or even a bony debridement procedure<sup>16</sup> if there is evidence of significant degenerative change. An interesting extension of this line of thinking is unanswered in 2010: does the ultimate stability procedure

(a pubic symphysis stabilisation or even fusion) have a place at the top of the chain in sports surgery? These were not uncommonly performed on athletes in the 1970s, but reports since then have been very isolated<sup>17</sup>. For small joints where the movement can be 'sacrificed' (e.g. a finger DIP joint), fusion is often a better alternative than attempts at repair. For larger joints (e.g. the lumbo-sacral articulation) fusion is known to be an end stage definitive surgical option with the significant issue of late stress transference to nearby joints. Whether the positive (of removing instability/movement) would outweigh the negative (of stress transfer to the hip joints etc.) in pubic symphysis stabilisation is an important question. The principle is consistent with the thesis of this article, however, there appears to be a trade off between stability and morbidity/return time for many of the common sports surgeries.

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## Conclusion

The concept of the 'gold standard' surgery for a particular condition may be outdated for many of the common sports injuries encountered. Pathology only exists in the context of a patient who may be young or old, high or low demand and with a good or problematic prognosis. Sports surgery has

advanced so that multiple techniques have been established for the one pathology. The technique offering the most definitive stability is generally not the one with the most rapid return to sport and lowest morbidity. Table 3 offers a summary of the continuum between the surgical (and sometimes non-surgical) options for some of the common severe sports injuries.

**Table 3 – Comparison of stability and morbidity trade-offs**

Diagnosis	Least stable Low morbidity Quickest recovery	Medium trade-off	Very stable Higher morbidity	Most stable; highest morbidity
<b>ACL tear</b>	LARS ligament/allograft/ conservative	Hamstring graft	BTB (patellar tendon) graft	BTB + extra-articular augmentation
<b>Bankart lesion</b>	Capsular shrinkage	Arthroscopic Bankart repair	Open Bankart repair	Latarjet procedure
<b>Syndesmosis sprain</b>	Boot immobilisation with accelerated return	Plaster or NWB boot for 6 weeks	'Tightrope' procedure	Screw fixation
<b>Patella instability</b>	Brace	Lateral release/ arthroscopic lavage	Repair/ reconstruction of medial patellofemoral ligament	Tibial tubercle transfer
<b>Footballer's groin</b>	Conservative treatment	Adductor procedure or endoscopic hernia repair	Open combined adductor release/ inguinal reconstruction; wedge resection	Pubic symphysis fusion

## John Orchard

Adjunct Associate Professor  
University of Sydney

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