

# Long-Term Safety of Using Local Anesthetic Injections in Professional Rugby League for Modified Indications

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## Abstract

**Objective:** To assess and evaluate the long-term safety of local anesthetic injections before or during games in professional rugby league players. **Design:** Retrospective case series. **Setting:** Professional rugby league team. **Participants:** Sydney Roosters players over a 6-year period (2008-2013), who had been administered a local anesthetic injection for an injury before or during a match to aid return to play. **Interventions:** Follow-up survey (no active intervention). **Main Outcome Measures:** Player self-reported satisfaction. Survey results were compared with a previous cohort who had received local anesthetic injection from 1998 to 2007. **Results:** Thirty-two players who had been injected with local anesthetic on 249 occasions for 81 injuries completed the current survey at an average of 5.64 years postinjection. In the cohort of 2008 to 2013, fewer injections were performed to areas deemed higher risk compared with the 1998 to 2007 cohort ( $P < 0.00002$ ). The vast majority of players (80/81 cases) would repeat the injection in the same circumstances and reported that ongoing side effects were uncommon. There were 6 cases (8%) in which players reported significant ongoing pain in the area of injection at long-term follow-up. **Conclusions:** This study affirmed the long-term safety of injections in most cases. **Level of Evidence:** IV.

**Key Words:** local anesthetic, sports medicine, injuries, bupivacaine, rugby league

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## INTRODUCTION

Local anesthetic is commonly used in the sports management of some professional athletes to provide immediate pain relief, so that an injured player may either continue participating in matches or to allow them an earlier return. There are no major current guidelines in place regarding their use in Rugby League, and some sports physicians argue that the practice is unethical and unsafe. However, given the lack of publications regarding the long-term follow-up on their use, the views stem more from preconception rather than clinically based data.<sup>1-4</sup>

The benefits and harms of local anesthetic injections have been previously investigated in a professional team over a 10-year period (249 injuries in 100 rugby league players),<sup>5</sup> by an author group that overlaps with our current one. Although there were minor complications (eg, hematoma and chronic scarring were reported in the injection region at the iliac crest), and some major complications (complete fracture of trapezium, complete rupture of supraspinatus tendon), no career-

ending complications were reported. The study conclusion was that injections to the wrist, sternum, and ankle had a higher risk of complications, and should be performed with caution or avoided. This suggests that the risk of complications is contingent on the location of the injury site and its nature.<sup>5</sup>

This study will investigate the perceived side effects and long-term safety associated with local anesthetic injections in professional rugby league players over a (later) 6-year period from 2008 to 2013. The setting for this current study is designed to be comparable to the previous one, with the following important exceptions:

1. The team physician authors in this study (J.W.O. and A.I.) had the results of the first study known, which was likely to have affected choice of injuries to inject;
2. Some, but not all, of the injections in the current cohort were done with an ultrasound-guided technique;
3. Follow-up for the current study was more “at arm’s length” from the players; results were received by research members that had never worked with the rugby league team to reduce the impact an ongoing relationship with the doctor/team may have on reported results.

We again hypothesized that local anesthetic injections are relatively safe, and that our data will reinforce and extrapolate from the results of the previous study (1998-2007), providing further evidence about the (low) risks associated with anesthetic injections when performed by an experienced physician. The study further aims to facilitate a discussion around the implementation of guidelines to help protect the rights of the players, the organization, and team physician. We hypothesize that fewer injections were performed in areas considered to be higher risk in the 2008 to 2013 cohort, and as

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### Clinical Relevance

A limited number of injections (eg, A/C joint) may be given safely and effectively to professional rugby league players when administered by an experienced physician, although there is a small risk of long-term complications.

such predict a lower overall incidence of perceived long-term complications.

### METHODS

The study design is a retrospective case series involving players who received a local anesthetic injection for injuries while playing a match for the Sydney Roosters rugby league team over the period of 2008 to 2013. The primary team physician J.O. recorded in a database all cases of players who had been injected with local anesthetic for an injury immediately before, or during, a rugby league match over 6 seasons. There were 124 injuries in 52 athletes who were treated at the area of injury with an anesthetic injection either “unguided” (265 injections) or under ultrasound-guidance (104 injections). The preparation and administration of the local anesthetics was otherwise similar to the previous cohort, with most cases using Bupivacaine as the primary active anesthetic.<sup>5</sup> Verbal consent was obtained at the time from players by the treating physician, but no waiver was signed or written consent obtained. The decision to give an injection was based on site of injury, level of pain, and the ability of the athlete to continue to play considering previous study findings of high-risk and low-risk regions for injection.

#### Study Design

In 2016, a list of players who had been administered local anesthetic while playing for the Sydney Roosters rugby league team (2008-2013) was established. Fifty-two players were attempted to be contacted by email to participate in the study by J.W.O. initially (and then potentially other members of the research team if they did not respond to the initial survey request). Eight of the 52 players were still playing at the Sydney Roosters club at the time of survey, and for practical reasons these players were re-contacted, if necessary, by S.A.B. and A.I. (who worked at the club in 2016).

All players were provided with a “participant information sheet” and an individualized link to an online questionnaire to answer questions regarding the injection they received for

their injury (“case”), their reason for receiving an injection, and any perceived side effects or long-term complications. If the player had received an injection for more than one injury, they were asked to answer the same survey questions for the additional injuries (“cases”).

To eliminate potential bias, the study was single blinded so that those involved in the management of the players did not have access to individual responses. Players were de-identified, and data were collected and analyzed by independent assessors. This methodology was preferred to allow players, if they wished, to be more critical of the effects of local anesthetic injections, knowing that their responses would not be seen by the treating medical staff. If the players chose to participate, they would complete the online survey. Data collected were transmitted through a secure network to a database in which data merging was performed before data analysis.

The questionnaire was identical to the previous study<sup>5</sup> other than being online rather than paper format. The results were then compared with those of the previous study cohort that received injections from 1998 to 2007.

#### Statistics

Descriptive statistics were applied to analyze the study population and the questionnaire findings were reported as percentages rounded to the nearest whole number; therefore, some table rows and columns appear to sum to 99% or 101%, rather than 100%. A  $\chi^2$  test was used to compare the number of injections performed at high-risk areas between the 2 study populations (2008-2013; 1997-2003) and test the level of significance. Survey results of the current 2008 to 2013 study population were compared with the previous 1997 to 2003 cohort and assessed using Mann-Whitney *U* test. An alpha ( $P < 0.05$ ) was statistically significant. All statistical analyses were performed using IBM SPSS Statistics for Windows, V24 (IBM Corp, Armonk, NY).

#### Ethical Considerations

This study (2016/539) was approved by the Human Research Ethics Committee at the University of Sydney. The study was also approved by the National Rugby League Research Board.

### RESULTS

Follow-up achieved was 32 of 52 players (62%) and 81 of 124 cases (65%), with many players representing multiple cases (ie, different injuries/injection series) (Table 1). For analysis of

**TABLE 1. Summary of Cases**

Injury Type	Total Cases	Total Injections	Injections per Case (Average)	Cases Followed-up	Percentage Follow-up	Length of Follow-up, yr
Hand injuries	20	63	3.2	15	75	5.0
Wrist injuries	7	24	3.4	3	43	5.2
A/C joint injuries	33	157	4.8	22	67	6.1
S/C joint and sternum injuries	15	37	2.5	11	73	5.4
Rib injuries	21	50	2.4	16	76	5.4
Iliac crest contusions	13	18	1.4	8	62	6.2
Ankle injuries	3	7	2.3	1	33	8.3
All other injuries	12	13	1.1	5	42	6.1
Total	124	369	3.0	81	65	5.64

**TABLE 2. Comparison of Injections Numbers Between the 2 Groups**

Injury Classification	Group		Average No. of Injections per Case
	2008-2013	1998-2007	
Hand	3.2	3.1	3.2
Wrist	3.4	4.4	4.0
A/C Joint	4.8	4.6	4.7
S/C Joint and sternum Injuries	2.5	3.4	3.2
Rib injuries	2.4	3.2	2.8
Iliac crest contusions	1.4	2.8	2.3
Ankle injuries	2.3	2.6	2.7
Other injuries	1.1	2.5	2.2
Total	3.0	3.3	3.2

results, the injuries were categorized into 8 anatomical injury types. The average follow-up time was 5.64 years, and on average 3.0 injections were given per injury site (similar to previous study, Table 2). The highest average number of injections was given to acromioclavicular joint injuries with an average of 4.8 injections per injury. Of the 20 players who did not participate, we estimate that 14 players were unable to be contacted (eg, no latest email available or evidence that email was being actively used) and 6 players probably declined to participate in the survey (eg, a known active email was used for contact, but the player did not complete the survey despite reminder invitations).

For most of the cases, the player recalled receiving a local anesthetic to a specific injury site (Table 3). The rationale for local anesthetic use is illustrated in Table 4. Most players believed that the primary influence in deciding to use a local anesthetic was either their own desire to not miss a game, 53 cases (65%) or to not play the game in pain, 25 cases (31%). Pressure from their coach was reported in one case of rib injury, and recommendation by the treating doctor was indicated in one hand injury case. Comparison with the previous 1997 to 2003 cohort study showed that there was no statistical significance ( $P = 0.384$ ) between the groups with respect to the rationale for receiving an anesthetic injection (Table 5).

The players were asked to report whether they felt that the injections helped them in their performance (Table 6). Most players found the injections to be helpful at the time; 96% ( $n = 78$  cases) indicated that the injections were very helpful or somewhat helpful. There were 2 cases (2%)—injections to the

medial collateral ligament of the knee and one of the iliac crest hematomas—that felt that the injections were not helpful. All 18 cases (100%) of hand and wrist injuries reported that the injections were very helpful. Perceived helpfulness in the 2 study cohorts (2008-2013; 1998-2007) is illustrated in Table 7 ( $P = 0.145$ ).

The perceived side effects experienced with local anesthetic use is explored in Table 8. No side effects from local anesthetic use were reported in 45 cases (56%). A significant number of players felt that the anesthetic injection delayed recovery from their injury (29 cases or 36%), or that the injury was worsened (5 cases or 6%) by playing with the local anesthetic. More specifically, players felt that injury was worsened by playing with the anesthetic injection in A/C joints (2 cases), iliac contusions (1 case), knee medial collateral ligament (1 case), and rotator cuff (1 case). There were no reports of sensory nerve block by players in this series. The perceived side effects in the 2 study populations (2008-2013; 1998-2007) are illustrated in Table 9 ( $P = 0.111$ ).

The long-term perception of pain is indicated in Table 10. Most players reported minimal to no side effects in 75 cases (93%). There were 6 cases (7%) that reported having significant pain that is unresolved, and one knee and one hip (iliac crest) injection reported experiencing this pain daily. No statistical significance was found with previous study cohort (Table 11,  $P = 0.619$ ).

The overall experience of the players with regard to local anesthetic use was summarized in Table 12. In 13 cases (16%), players stated that they would repeat the process, although they would not recommend it to others. Of these 13 cases,

**TABLE 3. Recall of Local Anesthetic Use**

Injury Type (No. "Cases")	Yes, Very Clearly	Yes, but Only Vaguely	Hardly at All
Hand (15)	14 (93%)	1 (7%)	—
Wrist injuries (3)	3 (100%)	—	—
A/C joint injuries (22)	16 (73%)	4 (18%)	2 (9%)
S/C joint and sternum injuries (11)	9 (82%)	2 (18%)	—
Rib injuries (16)	8 (50%)	8 (50%)	—
Iliac crest contusions (8)	5 (63%)	3 (37%)	—
Ankle injuries (1)	1 (100%)	—	—
All other injuries (5)	5 (100%)	—	—
Total (81)	61 (75%)	18 (22%)	2 (3%)

**TABLE 4. Rationale for Local Anesthetic Use**

Injury Type (No. "Cases")	Own Desire Not to Miss a Game	Own Desire to Not Play the Game in Pain	Pressure From the Coach, %	Recommendation of Doctor, %	Cannot Recall or Other, %
Hand injuries (15)	7 (47%)	7 (47%)	0	1 (7%)	0
Wrist injuries (3)	1 (33%)	2 (67%)	0	0	0
A/C joint injuries (22)	14 (64%)	7 (32%)	0	0	1 (4%)
S/C joint and sternum injuries (11)	10 (91%)	1 (9%)	0	0	0
Rib injuries (16)	11 (69%)	4 (25%)	1 (6%)	0	0
Iliac crest contusions (8)	6 (75%)	2 (25%)	0	0	0
Ankle injuries (1)	1 (100%)	0	0	0	0
All other injuries (5)	3 (60%)	2 (40%)	0	0	0
Total (81)	53 (65%)	25 (31%)	1 (1%)	1 (1%)	1 (1%)

**TABLE 5. Comparison of 2 Cohorts Rationale Associated With Local Anesthetic Use**

Rationale for Anesthetic Use	Group		Total
	2008-2013	1998-2007	
Not miss game	53 (66%)	150 (63%)	203 (63%)
Not play game in pain	25 (31%)	71 (30%)	96 (30%)
Pressure from coach	1 (1%)	8 (3%)	9 (3%)
Recommendation of doctor	1 (1%)	11 (5%)	12 (4%)
Total Injuries ("cases") where there was recall	80 (100%)	240 (100%)	320 (100%)

*P = 0.384 based on analysis of results without cannot recall.*

62% (n = 8 cases) had suffered no side effects or long-term pain but still felt that the process was dangerous. On the contrary, there were some players who stated that although they felt they were not back to normal, they would still repeat the process as they wanted to continue match play. The lowest satisfaction was reported in one case of a single knee medial collateral ligament injection in which the player reported that he would not repeat the process if he had this injury again. Overall, most players, 80 cases (99%) would repeat the use of local anesthetic injection if they had their injury again, as they wanted to continue match play and felt that the benefits outweighed the anticipated risks. The results of the long-term pain perceived were subsequently compared with the previous cohort (Table 13).

The long-term pain perceived by a player was subsequently compared with the number of injections per injury. No correlation could be found between the number of injections

administered and the likelihood of experiencing long-term pain in the area injected (Table 14). The number of injections administered to areas deemed high risk and low risk were also compared in the 2 study cohorts (Table 15). It was found that there was a decrease in the overall number of injections administered specifically to areas of high risk ( $P = 0.00002$ ).

## DISCUSSION

Our study determined that although the current cohort commonly reported a high rate of perceived initial delayed recovery from injury, the rate of long-term complications was low. Most players (99%) from this cohort would repeat the process if they had their time again, as they believed that the benefits outweighed the risk. Therefore, it may be suggested that when injections are administered to a low-risk injury site as defined by the initial study, there are minimal risks of

**TABLE 6. Perceived Helpfulness of Injection**

Injury Type (No. "Cases")	Very Helpful	Somewhat Helpful	Not Helpful	Cannot Recall
Hand injuries (15)	15 (100%)	0	0	0
Wrist injuries (3)	3 (100%)	0	0	0
A/C joint injuries (22)	17 (77%)	4 (18%)	0	1 (5%)
S/C joint and sternum injuries (11)	10 (91%)	1 (9%)	0	0
Rib injuries (16)	11 (69%)	5 (31%)	0	0
Iliac crest contusions (8)	5 (63%)	2 (25%)	1 (12%)	0
Ankle injuries (1)	0	1 (100%)	0	0
All other injuries (5)	4 (80%)	0	1 (20%)	0
Total (81)	65 (80%)	13 (16%)	2 (2%)	1 (%)

**TABLE 7. Comparison of 2 Cohorts Perceived Helpfulness Associated With Local Anesthetic Use**

Pain Helpfulness	Group		Total
	2008-2013	1998-2007	
Very helpful	65 (80%)	182 (73%)	247 (74%)
Somewhat helpful	13 (16%)	51 (20%)	64 (19%)
Not helpful	2 (2%)	7 (3%)	9 (3%)
Can't recall	1 (1%)	11 (4%)	12 (4%)
Total injuries ("cases")	81 (100%)	251 (100%)	332 (100%)
P = 0.145.			

**TABLE 8. Perceived Side Effects**

Injury Type (No. "Cases")	No Side Effects	Injury Took Longer to Recover Than I Thought It Would	Injury Was Worsened by Playing With Local Anesthetic	Nerve Block—Couldn't Properly Feel or Move Part of Body	Other
Hand injuries (15)	7 (47%)	8 (53%)	0	0	0
Wrist injuries (3)	3 (100%)	0	0	0	0
A/C joint injuries (22)	12 (55%)	7 (32%)	2 (9%)	0	1 (4%)
S/C joint and sternum injuries (11)	8 (73%)	2 (18%)	0	0	1 (9%)
Rib injuries (16)	9 (56%)	7 (44%)	0	0	0
Iliac crest contusions (8)	5 (63%)	2 (25%)	1 (12%)	0	0
Ankle injuries (1)	0	1 (100%)	0	0	0
All other injuries (5)	1 (20%)	2 (40%)	2 (40%)	0	0
Total (81)	45 (56%)	29 (36%)	5 (6%)	0	2 (2%)

complications and thus can be considered relatively safe in the context professional sport.

The generally high satisfaction rates from this procedure are worth comparing to alternative pain-relieving options available to professional athletes. A high percentage of players may alternatively opt to use painkillers such as NSAIDs or codeine-containing oral medications. The long-term legacy of these oral medications can be far more severe, including kidney and cardiac damage,<sup>6</sup> as well as addiction to opiates, all of which have been described in retired professional athletes as well as the general population<sup>7</sup> and all of which can result in death as the worst possible outcome. Although retired players occasionally complain about the legacy of painkilling injections, it is even more common for retired players to publicly express regret for having taken too many oral NSAID and opiate

medications during their careers and, also, after their careers have finished. Painkilling injections provided by a team doctor obviously are ceased on retirement, whereas addiction to oral painkilling medications can persist for many years post professional sporting career.

A notable finding was a decline in some of the satisfaction rates of the current study cohort, which in fact rejected our hypothesis that satisfaction may be higher because of the emphasis on performing mainly lower-risk (area) injections. There was also an increase in the proportion of players who believed that the process was dangerous, and that although they would repeat it, they would not recommend it to others. One strength of the current study over the previous study was the fact that it was single blinded; no members involved with the current management of the players had access to the

**TABLE 9. Comparison of 2 Cohorts Perceived Side Effects Associated With Local Anesthetic Use**

Pain Perceived	Group		Total
	2008-2013	1998-2007	
No side effects	45 (56%)	168 (67%)	213 (65%)
Recovery delayed	29 (36%)	55 (22%)	84 (25%)
Injury worsened	5 (6%)	14 (6%)	19 (6%)
Nerve block	0 (0%)	4 (1%)	4 (1%)
Other	2 (2%)	8 (3%)	10 (3%)
Total injuries ("cases")	81 (100%)	249 (100%)	330 (100%)
P = 0.111.			

**TABLE 10. Long-Term Perceived Pain Associated With Local Anesthetic Use**

Injury Type (No. "Cases")	None at All in that Body Part, %	An Occasional Niggle but Nothing Too Severe, %	Some Bouts of Significant Pain and Not Back to Normal, %	Pain Everyday Which Affects My Enjoyment of Life, %
Hand injuries (15)	12 (80%)	2 (13%)	1 (7%)	0
Wrist injuries (3)	1 (33%)	1 (33%)	1 (33%)	0
A/C joint injuries (22)	15 (68%)	6 (27%)	1 (5%)	0
S/C joint and sternum injuries (11)	5 (45%)	5 (45%)	1 (9%)	0
Rib injuries (16)	14 (88%)	2 (13%)	0	0
Iliac crest contusions (8)	6 (75%)	1 (12%)	0	1 (12%)
Ankle injuries (1)	0	100	0	0
All other injuries (5)	3 (60%)	1 (20%)	0	1 (20%)
Total (81)	56 (69%)	19 (23%)	4 (5%)	2 (3%)

**TABLE 11. Comparison of 2 Cohorts: Long-Term Perceived Pain Associated With Local Anesthetic Use**

Pain Perceived	Group		Total
	2008-2013	1998-2007	
None	56 (69%)	180 (72%)	236 (71%)
Occasional niggle	19 (23%)	56 (22%)	75 (23%)
Significant pain	4 (5%)	13 (5%)	17 (5%)
Pain everyday	2 (3%)	2 (1%)	4 (1%)
Total injuries ("cases")	81 (100%)	251 (100%)	332 (100%)
P = 0.619.			

results, and this may have allowed the players to give more honest answers as they perceived that the survey was more anonymous.

Previously, athletes may have perceived injury as an individual risk that could eventuate any time they stepped on the field. However, the rise of a litigious society, as well as an expansion in information regarding the long-term complications of sports injuries such as concussions, has meant that players may now be shifting some blame for longer-term consequences of their injuries to third parties (doctors, teams, and sporting organizations). It is outside the scope of this study to debate the burden of responsibility for long-term physical consequences of having had a career in a professional collision sport. However, we note that there has probably

been a cultural shift between our 2 studies that could make players more cautious of playing with an injury and more likely to attribute long-term pain to the use of painkillers rather than the inherent risks of the sport.<sup>8-10</sup> It is noteworthy that a team doctor is more passive with respect to the inherent nature of the sport but clearly more active when considering the use of injectable painkillers to continue playing.

There were 2 cases in this series in which player-perceived outcomes and satisfaction were poor. Both of these cases shared a common theme—that the doctor injected a location nearby a major joint, whereas the player post-career seemed to be perhaps suffering from osteoarthritis of the major joint. It was an assumption made by the treating doctor at the time that a nonarticular injection would not be responsible for

**TABLE 12. Overall Reflection of the Use of Local Anesthetic**

Injury Type (No. "Cases")	100% Happy to Repeat, %	Benefits Outweigh the Risks, %	Would Repeat but Wouldn't Recommend to Others, %	Wouldn't Do It Again, %
Hand injuries (15)	10 (67%)	4 (27%)	1 (7%)	0
Wrist injuries (3)	3 (100%)	0	0	0
A/C joint injuries (22)	11 (50%)	6 (27%)	5 (23%)	0
S/C joint and sternum injuries (11)	5 (45%)	4 (36%)	2 (18%)	0
Rib injuries (16)	7 (44%)	6 (38%)	3 (19%)	0
Iliac crest contusions (8)	6 (75%)	1 (13%)	1 (13%)	0
Ankle injuries (1)	0	0	1 (100%)	0
All other injuries (5)	2 (40%)	2 (40%)	0	1 (20%)
Total (81)	44 (54%)	23 (28%)	13 (16%)	1 (1%)

**TABLE 13. Overall Reflection on the Use of Local Anesthetic Between the 2 Groups**

Overall Reflection	Group		Total
	2008-2013	1998-2007	
100% happy to repeat	44 (54%)	162 (65%)	206 (62%)
Benefits outweigh risks	23 (28%)	68 (27%)	91 (27%)
Would repeat but not recommend to others	13 (16%)	17 (7%)	30 (9%)
Would not repeat	1 (1%)	4 (2%)	5 (2%)
Total injuries ("cases")	81 (100%)	251 (100%)	332 (100%)

**TABLE 14. Long-Term Pain Relationship to Number of Times Injected**

No. Injections	Cases	No Pain at All in that Body Part	An Occasional Niggle but Nothing Too Severe	Some Bouts of Significant Pain and Not Back to Normal	Pain Everyday Which Affects My Enjoyment of Life
1	31	20 (65%)	9 (29%)	1 (3%)	1 (3%)
2 or 3	26	21 (81%)	4 (15%)	—	1 (4%)
4 or 5	12	8 (67%)	3 (25%)	1 (8%)	—
6-9	7	2 (29%)	3 (42%)	2 (29%)	—
≥10	5	4 (80%)	1 (20%)	—	—
Total	81	55 (68%)	20 (25%)	4 (5%)	2 (2%)

later osteoarthritis (and hence that the nonarticular injections were “safe”). However it is not irrelevant that the players perceived at long-term follow-up that there was a connection between the injections to allow return to play and long-term pain. The medical presumption that an injection is nonarticular does not prevent player dissatisfaction from developing what he perceives to be a related complication.

Other studies have reported the use of local anesthetic injections in sports, although notably all have been with what may be viewed as an inferior methodology of assessment of safety through the clinician’s case notes rather than long-term player follow-up. A retrospective review was performed of 37 injuries in which local anesthetic (+/-corticosteroid) injections that were administered in 31 National Football League athletes occurring over a 3-year period (2006-2008). However, the methods of this study were not clear enough to differentiate how many of these injections were pre- or mid-game local anesthetic injections only, and how many were corticosteroid injections administered postgame (and how many had both). All local anesthetic injections were administered 1 hour before the game; injection sites included acromioclavicular joints, knee, elbow, and ankle sprains. Injections to the ankle were the most commonly administered site. The authors reported no major or minor complications from any of the local or ultrasound-guided injections over the

3-year period, but this was based on case note review rather than player follow-up.<sup>11</sup>

Another study assessed the use of ultrasound-guided local anesthetic injections in 3 Australian football matches (pre-game, during match and postgame). Although the players who had received injections were followed up, the physician’s clinical notes were used to report the short- and long-term outcomes for the players. The authors also failed to define a period for what was meant by long-term outcome, as they had also considered the injections to be effective if the player was able to play without limitations in the weeks after injection; however, this time is not sufficient to provide conclusions on long-term outcomes and recovery period of athletes who had received a local anesthetic injection.<sup>12</sup>

Our findings of the safety of lower-risk injuries correlated with the previous study findings, and fewer injections were performed in areas viewed as higher risk in our current study. More specifically, the ankle<sup>5</sup> and knee<sup>2</sup> have been suggested as higher risk areas in which injections should be avoided, as they may exacerbate the injury or increase risk of re-injury. In general terms, all intra-articular injections to major joints should be avoided or restricted because of the potentially direct chondrotoxicity of local anesthetic on hyaline articular cartilage.<sup>13</sup> Although we do not present a complete set of guidelines by location for local anesthetic injection in professional sport, it would be timely for a review paper to

**TABLE 15. Low-Risk Versus High-Risk Injections**

Injury Classification	Group		Total Injections
	2008-2013	1998-2007	
Low risk (injury to hand, A/C joint, rib, iliac crest contusion)	288	637	925
High risk (wrist, sternum, ankle)	68	287	355
Total	356	924	1280

P = 0.00002.

update safety based on location of injection and present guidelines for team physicians.

The study still has some limitations. Recall bias is a possibility in our retrospective review because of the length of the study design/average follow-up time. However, this is characteristic in any post activity questionnaire. Limitations with regard to the data collection process include lack of a control group (eg, a group of players who had comparable injuries but did not get offered injections to continue to play) and generally incomplete data regarding the injury history across a player's career and other treatments administered (eg, surgery).

The follow-up rate in this study, compared with our previous study in an earlier cohort of Sydney Roosters players, was slightly lower. This can be seen in 2 different ways as a limitation of either study. The lower follow-up rate in the current study may be less reflective of the total cohort as fewer athletes responded. However, because the earlier study was performed without the limitations of Ethics Committee restraints, the greater response rate was probably more subject to bias. For example, in the previous study, some of the surveys were completed with a face-to-face consultation between player and doctor (J.W.O.), which increased follow-up percentage but possibly could affect satisfaction rates reported (that is this methodology may have erroneously led to a greater reported satisfaction rate).

As we are only assessing player-perceived long-term follow-up rather than a complete functional assessment of the player, including establishing a baseline, conclusions regarding the safety of local anesthetics in the long-term are still incomplete. Nonetheless, this article can help provide guidance to sports physicians on assessing whether to offer an injection to a player.

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