

SHORT REPORT

The use of single dose intra-articular local anaesthetics in the United Kingdom: A cross-sectional survey of sport and exercise medicine and musculoskeletal professionals

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KEYWORDS

degenerative joint condition, knee, musculoskeletal, therapy

1 | INTRODUCTION

Degenerative joint disease, such as osteoarthritis, cause significant issues with pain, mobility, and declining quality of life (Newberry et al., 2017). Intra-articular joint injections are used by healthcare professionals to relieve symptoms and aid diagnosis of degenerative joint disease (Jayaram et al., 2019; Xie et al., 2015). The knee is one of the most common joints affected by degenerative joint disease, and intra-articular injections of the knee is a common procedure performed by Sport and Exercise Medicine (SEM) and musculoskeletal (MSK) clinicians (Hirsch et al., 2017; Zuber, 2002). A single-dose injection of local anaesthetic (LA) is often used for intra-articular injections, and there are several different LA agents that have differing characteristics such as onset of action, half-life, and side effects (Eng et al., 2014).

Recent studies have shown a controversial observation linking intra-articular LA with chondrotoxicity. A systematic review that included in vitro and in vivo animal studies highlighted that even a single-dose of commonly used LA can have a cytotoxic risk to articular tissue by impeding chondrocyte metabolism, resulting in chondrocyte death (Kreuz et al., 2018). SEM professionals are specialists in managing MSK issues and should be demonstrating leadership in highlighting best practice (FSEM, 2014). This study aims to assess the current use of LA in intra-articular knee injections in the United

Kingdom (UK) by SEM and MSK clinicians, explore reasons behind why individuals do or don't use LA, and explore if the use of LA by SEM physicians is different to non-SEM professionals.

2 | METHOD

A questionnaire was designed Craig Zalecki and Manoj Sivan to explore current usage of LA in intra-articular knee injections (Table 1). This was distributed online (via the organisation) to the members of the Faculty of Sports and Exercise Medicine, British Association of Sport and Exercise Medicine, Royal College of General Practitioners, Royal College of Physicians and Primary Care Rheumatology Society. The survey was closed to responses after 6 months. Participants had to be performing intra-articular knee injections to be eligible to take part. No pilot study was conducted.

For most of the questions participants selected from a list of choices. Free text boxes were used when participants were asked for justification of which LA they use, and what concentration and volume they use. The questionnaire took 10 min to complete. Consent was assumed by completion of the questionnaire. No identifiable information was obtained. Data was screened and cleaned by the research team and incomplete responses were removed (van den Broeck et al., 2005). Where appropriate, data was divided into

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Questions	
1	What type of clinician are you? Options: Physiotherapist, ESP, GP, orthopaedic surgeon, rheumatologist, SEM physician, rehabilitation physician, radiologist, orthopaedic practitioner, or other
2	Do you perform intra-articular knee injections? (Options: Yes or No) (asked to confirm eligibility for the study)
3	Do you use intra articular local anaesthetic when performing intra-articular knee injections? Options: Yes or No
4	If you answered yes to the previous question, which local anaesthetic do you use? Options: Lidocaine, bupivacaine, mepivacaine, ropivacaine, or other
5	Is there a particular reason for why you don't use LA? Or is there a particular reason why do you use that particular LA?
6	What concentration of your chosen local anaesthetic do you use?
7	What volume of local anaesthetic do you use?

TABLE 1 Questions included in the questionnaire (ESP: Extended Scope Physiotherapist; LA: local anaesthetics)

subgroups depending on their occupation to allow for comparison between SEM physicians (SEM registrars and consultants) and non-SEM professionals. Descriptive analysis of the questionnaire data was used and differences between subgroups were analysed using Statistical Package for the Social Sciences, version 25.0 (IBM Corp, Armonk, NY). Nominal data was analysed using chi-squared test. Statistical significance was set at $p < 0.05$.

3 | RESULTS

3.1 | Demographic information

A total of 219 responses were received, most commonly from GPs ($n = 80$) and SEM physicians ($n = 63$). Participants' occupations are outlined in Figure 1. Two percent of participants stated 'other' as their occupation (registered nurse [$n = 1$], an emergency physician [$n = 1$] and radiologist [$n = 3$]). When those that use LA for intra-articular knee injections were asked what volume and concentration they use, 10 respondents (6%) either did not specify the concentration or the volume of LA they use, and these specific responses were excluded.

3.2 | The use of local anaesthetics for intra-articular knee injections

Most participants (82% $n = 180$) stated they do use LA when performing intra-articular knee injections, with 18% stating that they do not. The split was similar between SEM physicians and non-SEM professionals, with 84% of SEM physicians and 81% of non-SEM professionals using LA. The difference was not statistically significant.

Of those that do use LA, 80% use lidocaine ($n = 145$), 18% use bupivacaine ($n = 32$), 2% use ropivacaine ($n = 3$), and none use mepivacaine (Figure 2). SEM physicians and non-SEM professionals demonstrated similar choice of LA with 79% of SEM physicians using

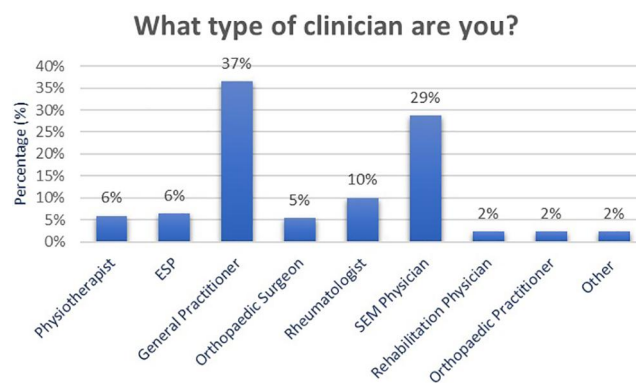


FIGURE 1 The occupations of the individuals that responded to the questionnaire (ESP: Extended Scope Physiotherapist)

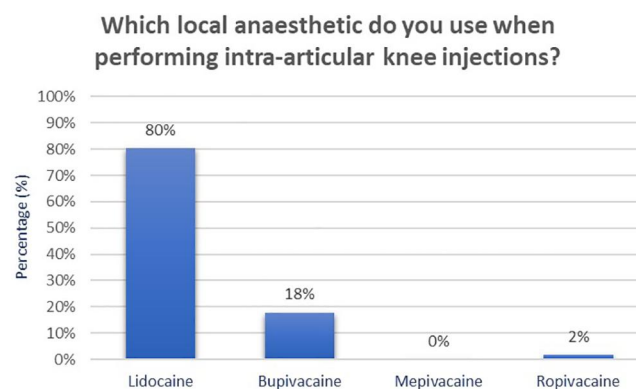


FIGURE 2 Preferred choice of local anaesthetics to use when performing intra-articular knee injections

lidocaine, 19% using bupivacaine and 2% using ropivacaine, compared to 81% of non-SEM professionals using lidocaine, 17% using bupivacaine and 2% using ropivacaine. The difference in choice of LA between SEM physicians and non-SEM professionals is not statistically significant.

3.3 | Justification for which type of local anaesthetics is used

Most individuals (80%) gave reasons as to why they prefer a particular LA or why they chose not to use LA, meaning 20% did not give a reason for their practice. The reasons that were given are outlined in Table 2. The most common justification for choosing a specific LA was availability, followed by habit. In total, 10% ($n = 22$) of participants mentioned chondrotoxicity as a factor in their decision making. Of note, 11 of these 22 individuals still chose to use the more chondrotoxic LAs (lidocaine and bupivacaine). Only 4% of respondents ($n = 8/219$) stated they do not use LA for intra-articular injections due to the chondrotoxic risk associated with them.

When comparing SEM physicians to non-SEM professionals, 21% ($n = 13/63$) of SEM physicians mentioned chondrotoxic risk in their justification for using a specific LA or not using LA at all, compared to 6% ($n = 9/147$) of non-SEM professionals. This difference is statistically significant ($p = 0.001$).

3.4 | Concentration and volume of local anaesthetics

For those individuals who use lidocaine, 94% ($n = 131$) use volumes between 1–5 mls, and 6% ($n = 8$) use between 6–10 mls. In terms of concentration used, for those who use 1–5 mls, 81% ($n = 106$) of them use 1% lidocaine, 12% ($n = 16$) use 2% lidocaine, and 7% ($n = 9$)

use either 1% or 2% lidocaine. Of those who use 5–10 mls of lidocaine, 63% ($n = 5$) use 1%, 13% ($n = 1$) use 2%, and 25% ($n = 25$) use either 1%–2%.

For individuals using bupivacaine, 54% ($n = 15$) use 1–5 mls and 46% ($n = 13$) use 6–10 mls. Of those that use 1–5 mls, 47% ($n = 7$) use 0.25% and 53% ($n = 8$) use 0.5%. Individuals that use 6–10 mls, 69% ($n = 9$) use 0.25%, 15% ($n = 2$) use 0.5%, 16% ($n = 2$) use 1%–3%. For ropivacaine, either 1% in 5–10 mls is used (33% $n = 1$), or 0.5% in 1–2 mls is used (67% $n = 2$).

4 | DISCUSSION

The key finding of this study is that most participants do use LA when performing intra-articular knee injections, with the vast majority using lidocaine or bupivacaine. To our knowledge, this is the first study to investigate practice of using LA for intra-articular injections among UK SEM and MSK professionals, while taking a focus on awareness of chondrotoxicity risk.

5 | MITIGATING THE POTENTIAL RISK OF LOCAL ANAESTHETICS

Numerous studies have shown that LA causes chondral damage, including one study specifically focussing on the knee joint (Hansen et al., 2007; Matsen & Papadonikolakis, 2013; Noyes et al., 2012).

TABLE 2 The justifications given for preferring a particular LA, or for not using LA, for intra-articular knee injections

Justification of LA use			
Justifications from individuals using lidocaine for intra-articular knee injections ($n = 145$)			
Availability	23% ($n = 34$)	Following local protocol	6% ($n = 9$)
Habit	19% ($n = 28$)	Analgesic effect	4% ($n = 6$)
No justification given	19% ($n = 28$)	Safe	4% ($n = 6$)
Taught to use lidocaine	14% ($n = 20$)	Less chondrotoxic	4% ($n = 6$)
Quick acting	10% ($n = 15$)	Colleagues use lidocaine	2% ($n = 3$)
Cost	8% ($n = 12$)		
Justifications from individuals using bupivacaine for intra-articular knee injections ($n = 32$)			
Long acting	47% ($n = 15$)	Availability	9% ($n = 3$)
Less chondrotoxic	16% ($n = 5$)	Taught to use bupivacaine	6% ($n = 2$)
No justification given	13% ($n = 4$)	Colleagues use bupivacaine	3% ($n = 1$)
Habit	13% ($n = 4$)	Short acting	3% ($n = 1$)
Justifications from individuals using ropivacaine for intra-articular knee injections ($n = 3$)			
Less chondrotoxic	100% ($n = 3$)	Availability	33% ($n = 1$)
Justifications from individuals not using LA for intra-articular knee injections ($n = 39$)			
No justification given	28% ($n = 11$)	LA not required	18% ($n = 7$)
Chondrotoxicity	20% ($n = 8$)	Clinical experience	10% ($n = 4$)
No meaningful, long term benefit	18% ($n = 7$)	LA reduces long term anaesthetic effect of steroid	3% ($n = 1$)

Abbreviation: LA, local anaesthetics.

Recent systematic reviews have found that, although no LA was completely safe, lidocaine and bupivacaine should be avoided as they demonstrate the highest levels of chondrotoxicity, and clinicians should preferably use mepivacaine and ropivacaine (Jayaram et al., 2019; Kreuz et al., 2018). However, most data collected in the studies used had been from in vitro, or in vivo animal studies. While we certainly need better data in human trials, until this data is collected the emerging data on the chondrotoxic risks of LA needs to be acknowledged. Given the additional concern of chondrotoxicity of intra-articular steroid injections, and that LA in combination with steroid may exacerbate chondrotoxic effects, we recommend that intraarticular injections are avoided where possible, with a stronger focus on alternative pain management such as weight loss and physiotherapy (Gupta et al., 2017; Morris et al., 2011; Nilsen et al., 2012).

6 | INCONSISTENT PRACTICE DESPITE AWARENESS OF CHONDROTOXICITY RISK

A higher proportion of SEM physicians were aware of the chondrotoxic risk of LA, yet this had no effect on their use of LA. Also, several individuals mentioned chondrotoxicity risk in their justifications despite using LA with higher chondrotoxic risk. The reasons for these inconsistencies are unclear and need further investigation. This may be due to lack of clarity over which LAs have been shown to be more chondrotoxic, or perhaps clinicians are not altering their practice due to the lack of research in human trials. It may be that most clinicians are used to injecting the more chondrotoxic LAs and habits can be difficult to change, or that more chondrotoxic LAs tend to be stocked (Bayliss et al., 2017).

Changing clinical practice and previous habits has proven to be a difficult process. The lag time between emerging evidence and its impact on practice and behaviours has been demonstrated previously (Breu et al., 2013; NICE, 2014).

7 | SEM PHYSICIANS MORE CAUTIOUS WITH LOCAL ANAESTHETICS USE

The need to optimise non-surgical management options of degenerative joint disease has been highlighted previously and is supported by National Institute for Clinical Excellence guidelines (Green et al., 1980; Yanamadala et al., 2013). Given that osteoarthritic cartilage is more at risk of cytotoxic damage than healthy cartilage, LA for intra-articular joint injections in the management of degenerative joint disease could result in poor long-term outcomes (Syed et al., 2011).

SEM physicians should be leading the way in championing and practicing the best possible conservative management options available (FSEM, 2014). Therefore, we need to ensure SEM physicians are practicing using the most up-to-date, evidence-based

information regarding intra-articular joint injections, and promoting this practice to others.

8 | NEXT STEPS

Clinicians should be educated on the emerging risk associated with LA and chondrotoxicity and the implications for patient's long-term outcomes and informed consent. Furthermore, it is essential for in vivo human studies to be carried out to confirm chondrotoxic effects of intra-articular LA. Changing clinical practice has shown to be more effectively implemented through the creation of guidelines, and this should be considered once we have adequate data from human studies (Law et al., 2015).

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Not applicable.

CONFLICT OF INTERESTS

None.

ETHICS STATEMENT

None.

AUTHOR CONTRIBUTION

Concept: Craig Zalecki. Design: Craig Zalecki, Manoj Sivan. Data collection: Craig Zalecki. Analysis: Craig Zalecki, Dane Vishnubala, Katie Marino. Draft and review of manuscript: Craig Zalecki, Manoj Sivan, Dane Vishnubala, Katie Marino, Camilla Nykjaer.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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REFERENCES

- Bayliss, L. E., Culliford, D., Monk, A. P., Glyn-Jones, S., Prieto-Alhambra, D., Judge, A., Cooper, C., Carr, A. J., Arden, N. K., Beard, D. J., & Price, A. J. (2017). The effect of patient age at intervention on risk of implant revision after total replacement of the hip or knee: A population-based cohort study. *The Lancet*, 389(10077), 1424–1430.
- Breu, A., Rosenmeier, K., Kujat, R., Angele, P., & Zink, W. (2013). The cytotoxicity of bupivacaine, ropivacaine, and mepivacaine on human chondrocytes and cartilage. *Anesthesia & Analgesia*, 117(2), 514–522.
- Eng, H. C., Ghosh, S. M., & Chin, K. J. (2014). Practical use of local anaesthetics in regional anaesthesia. *Current Opinion in Anaesthesiology*, 27(4), 382–387.

- FSEM. (2014). *A fresh approach in practice. A national health service information document*. Sport & Exercise medicine. <https://www.fsem.ac.uk/standards-publications/publications/a-fresh-approach-in-practice/>
- Green, L. W., Green, L. W., Kreuter, M. W., & Deeds, S. G. (1980). *Health education planning: A diagnostic approach*. Mayfield Publishing.
- Gupta, D. M., Boland, R. J., & Aron, D. C. (2017). The physician's experience of changing clinical practice: A struggle to unlearn. *Implementation Science, 12*(1).
- Hansen, B. P., Beck, C. L., Beck, E. P., & Townsley, R. W. (2007). Postarthroscopic glenohumeral chondrolysis. *The American Journal of Sports Medicine, 35*(10), 1628–1634.
- Hirsch, G., O'Neill, T. W., Kitas, G., Sinha, A., & Klocke, R. (2017). Accuracy of injection and short-term pain relief following intra-articular corticosteroid injection in knee osteoarthritis – an observational study. *BMC Musculoskeletal Disorders, 18*(1).
- Jayaram, P., Kennedy, D. J., Yeh, P., & Dragoo, J. (2019). Chondrotoxic effects of local anesthetics on human knee articular cartilage: A systematic review. *PM&R: The Journal of Injury, Function, and Rehabilitation, 11*(4), 379–400.
- Kreuz, P. C., Steinwachs, M., & Angele, P. (2018). Single-dose local anesthetics exhibit a type-, dose-, and time-dependent chondrotoxic effect on chondrocytes and cartilage: A systematic review of the current literature. *Knee Surgery, Sports Traumatology, Arthroscopy, 26*(3), 819–830.
- Law, T. Y., Nguyen, C., Frank, R. M., Rosas, S., & McCormick, F. (2015). Current concepts on the use of corticosteroid injections for knee osteoarthritis. *The Physician and Sportsmedicine, 43*(3), 269–273.
- Matsen, F. A., & Papadonikolakis, A. (2013). Published evidence demonstrating the causation of glenohumeral chondrolysis by postoperative infusion of local anesthetic via a pain pump. *Journal of Bone and Joint Surgery American Volume, 95*(12), 1126–1134.
- Morris, Z. S., Wooding, S., & Grant, J. (2011). The answer is 17 years, what is the question: Understanding time lags in translational research. *Journal of the Royal Society of Medicine, 104*(12), 510–520.
- Newberry, S. J., FitzGerald, J., & SooHoo, N. F. (2017). Treatment of osteoarthritis of the knee: An update review. *Comparative Effectiveness Reviews, 190*.
- NICE. (2014). *NICE guidelines: Osteoarthritis - Care and management*. <https://www.nice.org.uk/guidance/cg177/chapter/1-Recommendations#non-pharmacological-management-2>
- Nilsen, P., Roback, K., Broström, A., & Ellström, P. E. (2012). Creatures of habit: Accounting for the role of habit in implementation research on clinical behaviour change. *Implementation Science, 7*(1).
- Noyes, F. R., Fleckenstein, C. M., & Barber-Westin, S. D. (2012). The development of postoperative knee chondrolysis after intra-articular pain pump infusion of an anesthetic medication. *Journal of Bone and Joint Surgery, 94*(16), 1448–1457.
- Syed, H. M., Green, L., Bianski, B., Jobe, C. M., & Wongworawat, M. D. (2011). Bupivacaine and triamcinolone may be toxic to human chondrocytes: A pilot study. *Clinical Orthopaedics and Related Research, 469*(10), 2941–2947.
- vanden Broeck, J., Argeseanu Cunningham, S., Eeckels, R., & Herbst, K. (2005). Data cleaning: Detecting, diagnosing, and editing data abnormalities. *PLoS Medicine, 2*(10), e267.
- Xie, D. X., Zeng, C., Wang, Y. L., Li, Y. S., Wei, J., Li, H., Yang, T., Yang, T. B., & Lei, G. H. (2015). A single-dose intra-articular morphine plus bupivacaine versus morphine alone following knee arthroscopy: A systematic review and meta-analysis. *PLoS ONE, 10*(10), e0140512.
- Yanamadala, M., Wieland, D., & Heflin, M. T. (2013). Educational interventions to improve recognition of delirium: A systematic review. *Journal of the American Geriatrics Society, 61*(11), 1983–1993.
- Zuber, T. J. (2002). Knee joint aspiration and injection. *American Family Physician, 66*(8), 1497–1500, 1503–4, 1507.

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