

# Joint injection practices in Pediatric Rheumatology - A global survey

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## Research article

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# Abstract

**Background:** Intraarticular injections (IAI) were first reported in adult rheumatology in the 1950s and subsequently gained acceptance as a safe and efficacious treatment in Juvenile Idiopathic arthritis (JIA). IAIs are now widely performed and recommended as the initial or only treatment of Oligoarticular JIA and ancillary treatment of actively inflamed joints in other varieties of JIA. However, the performance of the procedure is not currently guided by standardized recommendations, thereby several practice variations are observed.

**Methods:** This worldwide survey of pediatric rheumatologists (with 50% response from Pediatric Rheumatology International Trials Organization: PRINTO and Pediatric Rheumatology Collaborative Study Group: PRCSG members) captures the differences in pre-procedural, procedural and post procedural protocols observed across the globe and asks the necessity of developing consensus in this area of Pediatric Rheumatology.

**Results:** This worldwide survey of Pediatric Rheumatologists had a response rate of almost 50% and captured the differences in IAI protocols observed across the globe.

**Conclusions:** Consensus plans are needed to ensure uniformity in this widely used procedure in Pediatric Rheumatology.

## Background

IAIs are a common practice in Pediatric Rheumatology, specifically in JIA. The earliest published study on IAI use in Pediatrics comes from Petty et al in 1986,<sup>1</sup> although there are anecdotal reports of pediatric joint injections predating this<sup>2</sup>. Currently, IAI is an accepted initial primary or supplemental tool in management of chronic arthritis in children. The use of glucocorticoid IAI in newly diagnosed children with oligoarticular JIA is recommended as the initial therapy by Beukelman et al<sup>3</sup> in the American College of Rheumatology (ACR) Recommendations for the Treatment of JIA: 2011, irrespective of disease activity and prognostic factors. Triamcinolone Hexacetonide (TH) is the recommended preferred therapeutic agent.

In a survey about initial treatment for knee monoarthritis in JIA among Pediatric Rheumatologists in North America, 63% respondents believed that corticosteroid injections were more efficacious than Non-Steroidal Anti-inflammatory Drugs (NSAIDs) and 90% used NSAIDs as an initial or subsequent treatment strategy<sup>4</sup>. Despite the wide use of this procedure in chronic arthritis in children, there are no standard recommendations or guidelines on IAI practices in Pediatric Rheumatology.

We conducted a 22-item web-based survey to explore practice variations in pediatric IAI across the world. This survey was disseminated on Survey Monkey to PRCSG and PRINTO groups in North America and Europe respectively.

## Objectives:

1. To describe global variations in IAI practices.
2. To explore the relation of these variations with physician demographic features.

## Methods

**Questionnaire design** – A 22-item questionnaire comprising three main sections was designed. Section A pertained to questions regarding procedural variations viz setting of joint injection, number of joints injected, use of Ultrasound guidance, choice and dose of therapeutic agent, availability of TH, anesthesia preferences, complications, techniques for prevention of complications, and post procedure practices. Section B addressed variations in practice for patients less than 5 years of age and Section C was focused on physician demographic characteristics. The questionnaire was pilot tested by 3 pediatric rheumatologists prior to dissemination.

**Subject selection** – The survey link was disseminated via email to: PRCSG (n=169), and PRINTO/PRES members (n= 568)

The survey was live for 2 months with one e-reminder sent at one month.

## Results And Discussion

The response rate was 48.5% (358/737). 310/358 respondents (87%) routinely performed IAI in their clinical practice. The remaining 48 responses were excluded from the analysis.

### Section A: Pre-procedure, procedure and post-procedure practices

**Setting of Joint injection:** 85% respondents said they performed the procedure in an outpatient procedure room, day care or minor Operation Theatre (OT). A minority (n=10, 3.32%) chose the major OT as a choice of setting for IAI. Approximately 8% used a combination of settings depending on age group and number of joints injected, one of which was Intensive Care Unit (ICU). Although cost implications of varying the setting of IAI are not well studied, it may be assumed that the setting will influence the cost of the procedure to the individual and the health care system.

**Number of joints injected:** Most respondents in this survey (80%) reported that they were comfortable injecting several joints in one sitting if required. The median number of joints injected per sitting was 4 (IQR: 4)

**Ultrasound guidance:** 52.16% respondents used Ultrasound to guide IAI either routinely (n=22) or selectively (n=135). Ultrasound guidance was reportedly useful for the hip, ankle, wrist, shoulder and small joints in declining order of importance. Although Ultrasound guided IAIs have proven targeted efficacy and safety for a broad spectrum of joints and tendons in Pediatric Rheumatology<sup>5,6</sup>, 47.84% of our respondents did not use Ultrasound. The precision offered by radiologically guided IAI certainly plays

a role in improved clinical response in JIA, along with systemic therapy, time of initiation of treatment, severity of the disease and other factors.

**Therapeutic agent:** Ignoring availability, the molecule of choice for joint injections was TH. However, more than 50% respondents reported that TH was either not available (41.9%) or sporadically available (9.51%) in their country. Other choices included Triamcinolone acetonide (TA), methylprednisolone, hydrocortisone and betamethasone. Comments regarding availability of TH were: “advocacy to bring it back would be great”, “Would like to use Aristospan (TH) but Kenalog (TA) is all we have available currently”, and “Prefer TH but not available currently in US so use TA”, indicating that availability of TH is perceived as a significant barrier in IAIs.

Small prospective trials and retrospective chart reviews have studied the efficacy of TA and TH in IAI and concluded that TH offers an advantage to TA, due to long duration of action<sup>7,8</sup>.

In a study by Eberhard et al from New York, 794 IAIs were examined of which 422 were injected with TH and 372 with TA. In this study, TH proved more effective than TA with respect to the time to relapse for first injection ( $p < 0.001$ )<sup>9</sup>.

**Dose of steroid in TH equivalent:** The most used dose of steroid (TH equivalent) for large and small joint injections was 1 mg/kg and 0.5 mg/kg respectively (n=180:64% and n=155:55% respectively). While these are the recommended doses, several dose variations were observed in this response, ranging from 0.5mg/kg (n=24) to 2 mg/kg (n=28) with a minority using 1.5 mg/kg (n=12) for large joints (knees, shoulders and hips) and 0.25 mg/kg (n=42), 1 mg/kg (n=35) and 2 mg/kg (n=1) for small joints

**Use of local anesthesia and sedation:** 68% of respondents used pre-procedure local anesthesia (LA): either Emla (Lidocaine-Prilocaine) cream, subcutaneous lidocaine, or a combination. Emla cream was the most popular (39.06%) topical agent of choice.

Additionally, short anesthesia (49%) and oral sedation (19%) were offered by most respondents. A minority (2.13%) selected long anesthesia and amongst those who selected “Other” (30.85%) included no anesthesia, a mix of sedation and short anesthetic or differing choice as per age group.

Malleson et al explored anesthesia practices in pediatric joint injections in a Childhood Arthritis & Rheumatology Research Alliance (CARRA) survey in 2010 and reported a lack of standard of care with respect to anesthetic practices in Pediatric Rheumatology<sup>10</sup>. In their study, 100% of respondents used some LA contrary to our results where more than 30% denied use of LA.

### **Complications and prevention:**

IAI is a safe procedure without major systemic side effects. The incidence of reported complications ranges from 2.6% to 8.3%<sup>6,11</sup>. Some known minor complications of IAI include infections, skin atrophy,

hypopigmentation, articular calcifications and avascular necrosis.<sup>12,13</sup> Similar complications were reported by the respondents in our survey (Table 1).

Techniques to prevent post-injection steroid leakage and subcutaneous atrophy included: reinjecting lidocaine (14.18%), quick withdrawal of needle (34.75%), combination of the above two (10.64%). 17% respondents reported no specific preventive measures. Amongst those who selected “other”, application of pressure, injecting normal saline, physiological serum, bupivacaine, air, limiting the volume injected, Z-track method and pressure application after needle withdrawal were reported.

**Post-procedure monitoring:** Most respondents monitored the patient in the hospital until the effect of anesthesia subsided (77%). We are not aware of any pediatric studies that explore the benefit of a longer period of rest. In the adult literature, the period of post procedure rest ranges between 24-72 hours<sup>14</sup> and is reportedly controversial<sup>15</sup>.

### **Section B: Age-related practices**

47% respondents followed significantly different practices for the <5year age group. Of these, the commonest age-dependent practice (72%) was choice of anesthesia. The CARRA survey<sup>10</sup> on anesthetic practices reported more use of LA in children > 8 years of age and general anesthesia in the younger age group.

### **Section C: Physician demographics**

60% respondents in this survey were formally trained in IAls, and 49% had more than 15 years of clinical practice. Variations in practices based on geographical location of the respondents and years of training was analysed with chi-square and Fishers exact tests. In the USA 47% respondents used pre-procedure LA, as compared to 75% in the UK, and this difference was significant (Chi-square=4.540, **p=0.033**). None of the other practices varied significantly by geographical location. There was no significant difference in practices based on years of clinical experience. 67% of physicians who had received formal training followed different practices for the 0-5-year age group (Use of ultrasound, choice of setting, choice of anesthesia, number of joints and post procedure monitoring) whereas none of those without formal training did. This difference was statistically significant with Fishers exact test (**p<0.0001**).

**Limitations of the study:** Surveys have an inherent limitation of differences in understanding and interpreting questions. Most questions in the survey were self-explanatory, however language differences may have resulted in difficulties in understanding the questions. Although 48% is considered as an excellent response rate, there remain 42% Pediatric Rheumatologists that likely use IAls in their practice who could not be reached through this survey.

## **Conclusions**

IAI is a common modality of treatment in JIA but does not have established practice standards. Individual and institutional preferences, as well lack of formal training for the procedure may explain some of these variations. A standardized protocol for IAI can be a part of the formal Pediatric Rheumatology training syllabus. Lack of availability of TH needs to be addressed.

**Future directions:** Further studies are needed to determine optimal procedural practices for joint injections. The authors strongly recommend the development of a working group dedicated to developing a consensus statement on this extremely common, safe and efficacious procedure in Pediatric Rheumatology.

## Declarations

Ethics approval was obtained from Ethics Committee of Jaslok Hospital and Research Center, Mumbai

Consent for Publication: NA

Availability of data and materials: The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

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Authors' contributions:

RPK: Conception of idea, design, data gathering, substantial revisions in manuscript

AD: Designing, data gathering, data analysis, manuscript drafting

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## Abbreviations

IAI: Intra-articular Injection

JIA: Juvenile Idiopathic Arthritis

PRINTO: Pediatric Rheumatology International Trials Organization

PRCSG: Pediatric Rheumatology Collaborative Study Group

ACR: American College of Rheumatology

TH: Triamcinolone Hexacetonide

TA: Triamcinolone Acetonide

NSAIDs: Non-Steroidal Anti-inflammatory Drugs

OT: Operation Theater

CARRA: Childhood Arthritis & Rheumatology Research Alliance

LA: Local Anesthesia

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## Table

**Table 1 – Complications of IAI**

Reported complication	Percentage of respondents reporting
Subcutaneous atrophy (drug leakage)	80
Fat necrosis	19.86
Local bleeding	13.83
Anesthetic complications	4.96
Iatrogenic infections	2.48
Tendon rupture	1.06
Hypopigmentation (without atrophy)	4 (n)
Periarticular calcifications	3 (n)
Pain	6 (n)
Seizures	1 (n)