CASE REPORT

DOI: 10.5336/caserep.2025-110934

Spinal Anesthesia in a Pediatric Patient with Achondroplasia: A Case Report

Merve GÖRGEL[a], Ahmet Rıdvan DOĞAN[b]

[a]Sakarya University Faculty of Medicine, Department of Anesthesiology and Reanimation, Sakarya, Türkiye
[b]Sakarya Training and Research Hospital, Department of Anesthesiology and Reanimation, Sakarya, Türkiye

ABSTRACT Achondroplasia is the most common skeletal dysplasia and is associated with craniofacial and vertebral anomalies that may complicate anesthetic management. While spinal anesthesia is considered safe in pediatric patients, its use in individuals with achondroplasia remains limited due to altered spinal anatomy and potential for exaggerated drug spread. We report a 17-year-old boy with achondroplasia who underwent spinal anesthesia for a minor surgical procedure. A reduced dose of 0.5% hyperbaric bupivacaine (1.2 mL) was administered intrathecally, providing effective sensory and motor block with no observed complications. The patient remained stable throughout the perioperative period and experienced no adverse effects postoperatively. This case highlights the feasibility of spinal anesthesia in pediatric achondroplasia when careful preoperative evaluation and individualized dose adjustment are implemented. We believe this case adds to the limited literature on regional anesthesia in pediatric patients with skeletal dysplasia.

Keywords: Achondroplasia; pediatric anesthesia; spinal anesthesia

Achondroplasia is the most common skeletal dysplasia leading to disproportionate dwarfism, with an estimated incidence of approximately 1 in 15,000 to 30,000 live births. It is characterized by autosomal dominant mutations in the fibroblast growth factor receptor 3 (FGFR3) gene, resulting in impaired endochondral ossification. Clinically, patients present with short limbs, macrocephaly, frontal bossing, midface hypoplasia, and various spinal deformities including thoracolumbar kyphosis and lumbar lordosis.[1]

These anatomical features carry important implications for anesthetic management. Airway evaluation may reveal a combination of macroglossia, limited neck extension, and a narrowed foramen magnum, increasing the risk of difficult mask ventilation, intubation, and potential for cervicomedullary compression during manipulation.[2] Additionally, vertebral abnormalities may lead to reduced cerebrospinal fluid volume and unpredictable spread of local anesthetics, complicating the administration of neuraxial techniques.

Despite these concerns, regional anesthesia may offer a safer alternative to general anesthesia in selected achondroplastic patients by minimizing airway intervention and avoiding polypharmacy. Spinal anesthesia is described in the literature as a safe, rapid-onset, and effective technique in pediatric patients when appropriate patient selection is made.[3] However, data on spinal anesthesia in pediatric patients with complex anatomical variations such as achondroplasia remain quite limited. In this report, we present our experience with successful spinal anesthesia in a adolescent male patient with achondroplasia undergoing pilonidal sinus surgery.

Correspondence: Ahmet Rıdvan DOĞAN
Sakarya University Faculty of Medicine, Department of Anesthesiology and Reanimation, Sakarya, Türkiye
E-mail: a.ridvandogan@gmail.com

Peer review under responsibility of Turkiye Klinikleri Journal of Case Reports.

Received: 31 Mar 2025 ***Accepted:*** 28 May 2025 ***Available online:*** 11 Jul 2025

CASE REPORT

A 17-year-old boy with a known diagnosis of achondroplasia, measuring 117 cm in height and weighing 42 kg, was scheduled for pilonidal sinus surgery. The patient was classified as American Society of Anesthesiologists physical status I. Preoperative airway evaluation revealed a mouth opening greater than 4 cm, a thyromental distance of 7 cm, a sternomental distance of 14 cm, and a Mallampati score of I. Cervical spine mobility was within normal limits. Upon admission to the operating room, baseline vital signs were as follows: blood pressure 121/81 mmHg, heart rate 110 bpm, and peripheral oxygen saturation (SpO_2) 98%. Informed consent for the procedure and anesthesia was obtained from the patient's legal guardian.

Following appropriate positioning in the sitting posture, spinal anesthesia was performed at the L3–L4 interspace using a 27-gauge Quincke needle. A total of 1.2 mL of 0.5% hyperbaric bupivacaine was administered into the subarachnoid space. The patient remained in the sitting position for 90 seconds after the injection and was subsequently placed in the prone position. Neurological assessment revealed a Bromage score of 1, with sensory blockade extending to the T10 dermatome via cold stimulation and to T8 via pinprick testing. The surgical duration was 36 minutes, and no intraoperative complications were observed.

At the conclusion of the procedure, vital signs were recorded as blood pressure 112/68 mmHg, heart rate 89 bpm, and SpO_2 99%. The Bromage score at operating room discharge was 1. During postoperative follow-up, motor block regressed to a Bromage score of 3 by the 2nd hour and to 4 by the 3rd hour. The patient initiated ambulation by the fourth postoperative hour, although spontaneous micturition had not yet occurred. At the 5th postoperative hour, the patient reported pain and received intravenous paracetamol. Spontaneous urination was achieved at that time. As no serious adverse events were observed, no regulatory reporting was required.

This manuscript adheres to the CARE guidelines as outlined by the EQUATOR Network. Written informed consent for publication was obtained from the patient's legal guardian, in accordance with institutional and international regulations.

DISCUSSION

Spinal anesthesia is considered a safe and effective technique in pediatric patients when appropriate conditions are met. Its advantages include avoidance of airway manipulation, rapid onset, and hemodynamic stability, making it a preferred option particularly for short-duration surgeries.[3,4] However, some clinicians remain hesitant to employ this technique in children, often due to concerns related to technical challenges, limited duration of effect, and the potential need for conversion to general anesthesia.[5]

Achondroplasia is a congenital skeletal dysplasia caused by a mutation in the FGFR3 gene, leading to disproportionate short stature, craniofacial abnormalities, and vertebral deformities.[6] Patients with this condition may present with macrocephaly, frontal bossing, midface hypoplasia, and a narrowed foramen magnum. These craniofacial features contribute significantly to the complexity of airway management. Difficult mask ventilation, limited neck extension, and risk of cervicomedullary compression are well-documented challenges during anesthesia induction.[2,7] The combination of macroglossia, short neck, and obstructive sleep apnea further increases perioperative airway risk.[2]

These anatomical and physiological characteristics make general anesthesia relatively risky in achondroplastic patients, especially when advanced airway equipment and experienced personnel are unavailable. Cervical spinal instability can further complicate airway maneuvers and increase the risk of neurologic injury.[8] Therefore, regional anesthesia techniques, when feasible, can provide a safer alternative by eliminating the need for airway instrumentation. Compared to general anesthesia, neuraxial blocks reduce systemic drug exposure, lower the incidence of postoperative nausea and vomiting, and allow faster recovery.[9]

Nonetheless, neuraxial anesthesia in achondroplasia presents its own challenges. Abnormal vertebral development may result in kyphoscoliosis, spinal canal stenosis, and ossification defects, all of

which contribute to technical difficulty and increased risk of block failure or complications.[10,11] Furthermore, altered epidural and intrathecal space geometry can cause unpredictable spread of local anesthetics. Several case reports emphasize the need for dose reduction to prevent high spinal levels.[6,9]

Although numerous case reports exist describing successful spinal or combined spinal-epidural anesthesia in adult patients with achondroplasia, data on pediatric patients with this condition remain scarce.[11-14] To our knowledge, the present case represents one of the few reported instances of successful spinal anesthesia in a pediatric patient with achondroplasia undergoing pilonidal sinus surgery.

In our case, we administered 1.2 mL of 0.5% hyperbaric bupivacaine, in line with the recommendations in existing literature suggesting lower intrathecal doses in achondroplastic individuals to prevent excessive cephalad spread.[6,9] The sensory and motor block was effective, and no complications were observed intra- or postoperatively.

Spinal anesthesia is also particularly suitable for procedures such as pilonidal sinus surgery, where limited surgical field and short duration allow for effective single-shot neuraxial blockade.[4] In our case, the desired block level was achieved promptly, the surgery was completed uneventfully, and no additional anesthetic support was required.

This case demonstrates that spinal anesthesia can be safely and effectively administered in pediatric patients with achondroplasia when thorough preoperative assessment, detailed airway evaluation, and meticulous anesthetic planning are employed. Despite the limited data in this specific population, particularly for non-obstetric procedures, our experience supports the feasibility of neuraxial anesthesia in selected cases.

CONCLUSION

This case supports the feasibility of spinal anesthesia in pediatric patients with achondroplasia when individualized anesthetic strategies and careful preoperative planning are applied. Recognizing the unique anatomical features of these patients and adapting the neuraxial approach accordingly can help avoid airway-related risks and improve patient safety. Our experience adds to the limited literature encouraging the use of regional anesthesia in achondroplastic patients beyond obstetric indications.

Source of Finance

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: *Merve Görgel, Ahmet Rıdvan Doğan;* ***Design:*** *Ahmet Rıdvan Doğan;* ***Control/Supervision:*** *Ahmet Rıdvan Doğan;* ***Data Collection and/or Processing:*** *Ahmet Rıdvan Doğan;* ***Analysis and/or Interpretation:*** *Ahmet Rıdvan Doğan;* ***Literature Review:*** *Merve Görgel;* ***Writing the Article:*** *Merve Görgel, Ahmet Rıdvan Doğan;* ***Critical Review:*** *Merve Görgel, Ahmet Rıdvan Doğan.*

REFERENCES

Pauli RM. Achondroplasia: a comprehensive clinical review. Orphanet J Rare Dis. 2019;14(1):1. PMID: 30606190; PMCID: PMC6318916.

2. Dang SH, Samra A, Patel BV, Sanchez-Luege S. Problematic Airway and Anesthetic Dilemmas for Achondroplastic Dwarfism in the Acute Care Setting: A Case Report. Cureus. 2022;14(5):e25336. PMID: 35774675; PMCID: PMC9236628.
3. Khrapak M, Everett T, Munshey F. Spinal anesthesia in children: an educational review. Colomb J Anesthesiol. 2024;(52):e1118. doi:10.5554/22562087.e1118
4. Akdenĩz S. An evaluation of spinal anesthesia results in pediatric patients undergoing pilonidal sinus surgery: a retrospective study. J Health Sci Med. 2023;6(6):1210-4. doi:10.32322/jhsm.1355839
5. Rehfuss A, Bogaert G, Kogan BA. Spinal anesthesia in children: most pediatric urologists are not on board. J Pediatr Urol. 2019;15(3):263.e1-263.e5. PMID: 30930017.
6. Brown A, Liu H, Chandler C. Anesthetic dilemmas in an achondroplastic patient undergoing elective cesarean section. J Biomed Res. 2024;38(5):512-5. PMID: 38832540; PMCID: PMC11461534.
7. Maharjan B, Singh J, Mishra SC, Neupane S. Airway management of a patient with achondroplasia using awake fiberoptic intubation: a case report. JCA Advances. 2024;1(3-4):100018. doi:10.1016/j.jcadva.2024.100018
8. Monedero P, Garcia-Pedrajas F, Coca I, Fernandez-Liesa JI, Panadero A, de los Rios J. Is management of anesthesia in achondroplastic dwarfs really a challenge? J Clin Anesth. 1997;9(3):208-12. PMID: 9172028.
9. Kim JH, Woodruff BC, Girshin M. Anesthetic considerations in patients with achondroplasia. Cureus. 2021;13(6):e15832. PMID: 34322329; PMCID: PMC8297512.
10. Oppitz F, Speulda E. Anaesthesia recommendations for Achondroplasia. Anaesthesia recommendations for Achondroplasia. 2019:1-10. https://www.orphananesthesia.eu/en/rare-diseases/published-guidelines/achondroplasia/671-achondroplasia/file.html
11. Lye S, Au Yong PS. Combined spinal-epidural for emergency cesarean section in a multiparous parturient with achondroplasia. Journal of Obstetric Anaesthesia and Critical Care. 2022;12(2):167-9. doi: 10.4103/JOACC.JOACC_109_21
12. Dumitrascu CI, Eneh PN, Keim AA, Kraus MB, Sharpe EE. Anesthetic management of parturients with achondroplasia during labor and delivery: a narrative review. Anesth Analg. 2025. PMID: 39903673. (Yıl bilgisi teyit edilmelidir.)
13. Dumitrascu CI, Eneh PN, Keim AA, Kraus MB, Sharpe EE. Anesthetic management of parturients with achondroplasia: a case series. Proc (Bayl Univ Med Cent). 2023;37(1):63-8. PMID: 38173994; PMCID: PMC10761160.
14. Gallagher SW, Chen W, Eduardo SCDT, Copacino BSC, Panda B, Dahlawi M. Combined spinal-epidural anesthesia for a primigravida with achondroplasia. MJCCS. 2023;7(1):1-3. doi:10.23880/mjccs-16000321