Management of intruded primary teeth using computer-controlled local anesthetic delivery systems

Tatalaksana gigi susu yang intrusi menggunakan sistem anestesi lokal yang dikendalikan komputer

[1]Andi Sri Permatasari, [1]Syakriani Syahrir, [1]Yayah Inayah, [1]Wiwik Elnangti Wijaya, [1]Adam Malik Hamudeng, [2]Rifaat Nurrahma, [3]Ita Purnama Alwi
[1]Department of Pediatric Dentistry, Faculty of Dentistry, Hasanuddin University
[2]Department of Prosthodontic, Faculty of Dentistry, Hasanuddin University
[3]Department of Orthodontic, Faculty of Dentistry, Hasanuddin University
Makassar, Indonesia
Corresponding author: **Andi Sri Permatasari**, e-mail: **andisripermatasari@unhas.ac.id**

ABSTRACT
Intrusion is the most common trauma in children. Management of intruded deciduous teeth includes spontaneous re-eruption or extraction. Pain management during extraction is performed with local anaesthesia, but this can cause fear and pain in patients. This case report describes the management of an intruded primary tooth using a computer-controlled local anaesthesia system (CCLAD). A 6-year-old boy presented with an intruded maxillary primary incisor following a fall from stairs the previous day. Clinical findings included swelling and ulceration of the lip and chin, haematoma, and gingival ulceration. Ellis Class IX fractures were noted in teeth 51, 61, and 62 with severe intrusion (grade III), slight mobility, and fusion of 61-62. Panoramic imaging revealed agenesis of teeth 22. After one week of observation for spontaneous re-eruption, extraction of teeth 51, 61, and 62 was performed due to the risk to the permanent replacement teeth. Anaesthesia was administered using the P-ASA (palatal-alveolar superior anterior) technique with SleeperOne5 (CCLAD), improving patient comfort and reducing fear. Monitoring over 12 months showed no complications. It was concluded that SleeperOne5 as a CCLAD with the P-ASA anaesthesia approach is a useful alternative for managing multiple impacted anterior deciduous teeth.
Keywords: Intrusion, primary anterior teeth, extraction, CCLAD, SleeperOne5

ABSTRAK
Intrusi adalah trauma paling umum pada anak-anak. Penanganan gigi susu yang terintrusi meliputi re-erupsi spontan atau ekstraksi. Laporan kasus ini menggambarkan pengelolaan gigi susu yang mengalami intrusi menggunakan sistem anestesi lokal yang dikendalikan komputer (CCLAD). Seorang anak laki-laki berusia 6 tahun datang dengan gigi insisivus susu maksila yang mengalami intrusi setelah jatuh dari tangga sehari sebelumnya. Temuan klinis meliputi pembengkakan dan ulserasi pada bibir dan dagu, hematoma, dan ulserasi gusi. Fraktur Kelas IX Ellis tercatat pada gigi 51, 61, 62 dengan intrusi parah (derajat III), mobilitas ringan, dan fusi 61-62. Pencitraan panoramik menunjukkan agenesis pada gigi 22. Setelah satu minggu observasi untuk re-erupsi spontan, ekstraksi gigi 51, 61, dan 62 dilakukan karena risiko terhadap gigi permanen pengganti. Anestesi diberikan menggunakan teknik P-ASA (palatal-alveolar superior anterior) dengan SleeperOne5 (CCLAD), meningkatkan kenyamanan dan mengurangi ketakutan pasien. Pemantauan selama 12 bulan tidak menunjukkan komplikasi. Disimpulkan bahwa SleeperOne5 sebagai CCLAD dengan pendekatan anestesi P-ASA merupakan alternatif yang berguna untuk mengelola gigi susu anterior yang intrusi secara multipel.
Kata kunci: infiltrasi, gigi primer anterior, ekstraksi, CCLAD, SleeperOne5
Received: 10 October 2025 Accepted: 15 November 2025 Published: 01 December 2025

INTRODUCTION

Intruded primary teeth are one of preschool children's most common traumatic dental injuries or TDI, causing tooth displacement.[1-5] Intrusion is the axial displacement of teeth into the alveolar bone, which damages the periodontal ligament and neurovascular bundle fibres with or without alveolar bone fracture.[6-8] Intrusion mainly affects primary teeth with damage to anterior teeth and contributes 4-22% of damage in primary teeth.[7] Several studies have shown that the prevalence of TDI in boys is two times higher than in girls.[1,9,10] Falls and accidents are the most common aetiology of TDI.[1,9-11]

The treatment of choice for intruded primary teeth is observation for spontaneous re-eruption or extraction. Factors such as the child's maturity and cooperative ability in emergency situations, oral habits, and timing of exfoliation determine the treatment plan. Management of intruded primary teeth depends on the clinical and radiographic examinations.[7,12-14]

Pain management during dental procedures is important in pediatric dentistry[15], such as extraction by administering local anaesthesia.[16,17] However, local anaesthesia can be a major factor causing fear and pain, especially in children[16], which has a psychological impact during the visit and influences treatment.[18,19] Important to explore approaches that reduce pain and discomfort during local anaesthetic administration.[20] A variety of computer-controlled local anaesthetic delivery systems (CCLAD) instrutruments are now available, also known as painless anaesthetic devices, which have the potential to minimize the painful experience during local anaesthetic administration.[20-23] Several CCLADs, such as The Wand®, Quicksleeper™, and Comfort Control Syringe have been developed.[20,23] The newest CCLAD tool is SleeperOne5 (Dental HiTec). There are few articles regarding using this tool[20,24–26] in combination with the P-ASA technique.[27] This case report describes the management of intruded anterior primary teeth by extraction using the P-ASA technique and SleeperOne5.

CASE

A 6-year-old boy with his parents came to Pediatric Dentistry Department complaining of an intruded maxillary primary incisor because he fell from the stairs one day ago. Informed consent was obtained from the mother's patient for the publication. Extraoral examination (Fig.1.) swelling and ulcerations of the lips and chin. TMJ was normal.

Intraoral examination (Fig.2) showed a hematoma on the mucosa of the upper lip, ulceration of the upper and lower lip and the maxillary anterior gingiva. Class IX Ellis fractures on 51, 61, 62 with intrusion grade III (severe) and mobility grade 1, 61 and 62 were fusion. Percussion

DOI 10.35856/mdj.v14i3.1429

Figure 1 Extraoral examination; **A** facial profile, **B** the patient's lips and chin

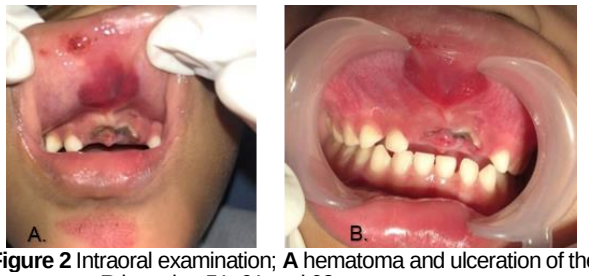

Figure 2 Intraoral examination; **A** hematoma and ulceration of the lip mucosa, **B** intrusion 51, 61 and 62

Figure 3 Panoramic

test positive. 74,75 and 84 were reversible pulpitis.

Caries risk assessment based on the American Academy of Pediatric Dentistry (AAPD) showed the patient was at moderate risk. Panoramic radiographic examination (Fig.3.) performed the depth of intrusion 51,61,62, the condition of successor 61, 62 were fused, 22 agenesis, and caries media on 74,75, and 84.

The first visit involved approaching and communicating with the patient and his mother, followed by anamnesis, a physical examination, and a radiographic examination. Behavioural assessment, according to Frankl, was positive. Disinfection using povidone-iodine was carried out at the first visit, and then applied the aloclair gel. The patient was prescribed amoxicillin, paracetamol, chlorhexidine 0.2% mouthwash, the aloclair gel, and Vitamin C. Patients were also educated to keep brushing their teeth regularly and have a soft diet. The patient was rescheduled for treatment one week later. On the second visit, prophylaxis was carried out. 51, 61 and 62 had re-erupted by approximately 2 mm (Fig.4). Ulcerations and hematomas on the lips have disappeared. GIC fillings on 74, 75, and 84.

The procedure extraction at the third visit was carried out. SleeperOne5 unit set up. Anaesthetic solution is put into the container, and then a 30G long 9mm extra short needle is inserted and connected to the electricity. The handpiece is placed in the holder. The patient is positioned supine with the head slightly tilted. The work area is disinfected. The topical anaesthetic was applied, and we waited for approximately 1 minute. The anaesthetic technique is P-ASA (Fig.5). The needle is inserted laterally from the incisor papilla while gently pressing on the wireless pedal mode 1 (green button). Aspiration is carried out slowly by stepping on the return button. If negative, the solution is deposited by pressing the mode 2 pedal. The indicator light will blink. Approximately 1.5 ml of anaesthetic is deposited, and the needle is slowly removed. The surrounding tissue looks white, and the patient feels numb.

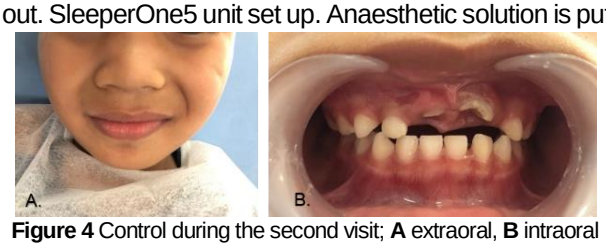

Figure 4 Control during the second visit; **A** extraoral, **B** intraoral

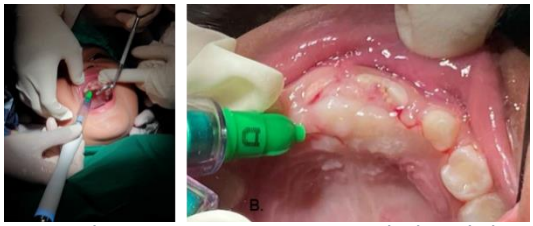

Figure 5A SleeperOne 5, **B** P-ASA anaesthetic technique with SleeperOne5

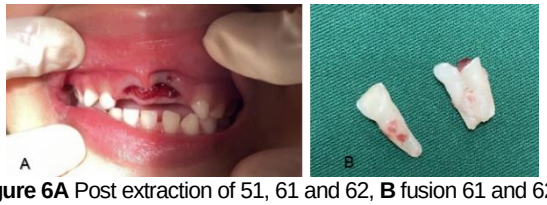

Figure 6A Post extraction of 51, 61 and 62, **B** fusion 61 and 62

The Wong-Baker Faces pain rating scale was recorded during anaesthesia administration to see the child's pain perception. 51, 61, and 62 have been extracted (Fig.6). The patient enjoyed it during the administration of local anaesthesia. The post-extraction area was given gauze, and the extraction scar was examined. Post-extraction instructions were given to the patient and his mother. The patient was given amoxicillin syrup 3x1½ cth, paracetamol syrup 3 x 1½ cth, and Minocep Garg (0.2% chlorhexidine) 2x/day. The patient was instructed to control the following week.

The fourth visit was controlled for one-week post-extraction. There were no complaints from the patient, and the healing was good. Subsequently, topical application of fluoride was performed on the patient. The patient was instructed to control at one month, three months, and one year later. The examination results showed no abnormalities or complaints from the patient (Fig.7).

DISCUSSION

The treatment of intruded primary teeth is spontaneous

Figure 7 Control three months after extraction

DOI 10.35856/mdj.v14i3.1429

re-eruption or extraction.[7] International Association of Dental Traumatology *(IADT)* suggest spontaneous re-eruption. Re-eruption occurs from six months up to 1 year.[11] According to Cameron,[28] if the crown is still visible and there is only minor damage to the crown, the tooth is observed and allowed to re-eruption. However, if all the crown intruded, extraction must be carried out. If the apex passes through the germ of the permanent tooth, tooth extraction is recommended to avoid possible damage to the permanent tooth.[4,6,28] A study showed that 65 out of 341 cases of re-eruption were eventually extracted due to complications such as periodontal tissue disorders, root resorption, and caries.[7,29] A study by Lenzi et al[13] stated that the trauma that caused the most damage to permanent tooth buds was the intrusion at 38.7%, with the most effective being hypoplasia. The intruded primary teeth 51, 61, and 62 were extracted cause the condition of the severe intrusion can affect the permanent teeth. A study observed that 52% of intruded teeth were allowed to re-erupt, showing developmental disorders.[7]

The local anaesthetic technique used a nerve block technique with *palatal approach-anterior superior alveolar* (P-ASA). According to Friedman and Hochman, using a P-ASA nerve block would be a great advantage because only one injection would anaesthetize all anterior maxillary teeth bilaterally without any side effects on the face, lips, and facial muscles.[30] According to Malamed[30], the current volume of anaesthetic recommended for the P-ASA is 1.4-1.8 mL, administered at 0.5 mL per minute.

The introduction of the CCLAD system has shown that injections, even in dense, highly innervated such as palatal tissue, can be easily performed with less pain. P-ASA injection can be performed using a traditional syringe, but a comfortable injection is more easily achieved using a CCLAD.[16,20,30] CCLAD SleeperOne5 has been developed as a solution to reduce pain associated with local anaesthetic injections. SleeperOne5 is designed to improve the ergonomics and precision of the dental syringe. The flow rate of the local anaesthetic solution is computer controlled with pressure and volume control that remains consistent from one drop to the next regardless of tissue resistance. The slow injection is stable and can be managed more precisely with a computerized system than a conventional one, and aspiration can be carried out on this device. The CCLAD system represents a significant change in the administration of local anaesthetics.[16,20] A dentist can accurately manipulate needle placement with fingertip accuracy and administer local anaesthesia with foot control using the device's wireless pedal. This tool has a lightweight handpiece, held like a pen, providing higher tactile control than conventional syringes.

Kwak et al[23] showed that CCLAD is more effective in reducing pain during local anaesthetic injection than conventional techniques. Feda et al[31] and Mittal et al[21] reported that there was no significant difference between conventional anaesthesia and CCLAD in the buccal area. However, anaesthesia on the palatal side produces less pain. The palatal mucosa is denser and requires pressure when administering the anaesthetic solutions.

Lambrecht et al[25] conducted a study using SleeperOne. Although the P-ASA technique using CCLAD has been reported to be beneficial compared to conventional techniques, the drawback is that this tool still needs to be widely used by practitioners and is associated with costs. Besides that, the disadvantage is that it requires more injection time. Longer duration might cause impatience and stress among kids, and more significant views might cause fear in pediatric patients. So, more research and case reports are needed regarding the effectiveness of using this tool for patients.

It is concluded that the use of SleeperOne5 as CCLAD with the P-ASA technique can be an alternative in dealing with intrusive trauma cases of several primary anterior teeth. However, further research is needed to evaluate the effectiveness of SleeperOne5 with different locations, techniques, and ages of children.

Conflict of interest
No conflict of interest

Acknowledgement
We thank the patients for consent to use their treatment records.

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DOI 10.35856/mdj.v14i3.1429