

## Case report: management of broken dental needles in practice

Breakage of a dental needle is a rare but significant complication of local anaesthetic injections, which causes great anxiety for the patient and dental surgeon, and necessitates investigations and further treatment. It may have important medico-legal considerations. We describe a case where a dental needle broke during the routine administration of an inferior alveolar nerve block for a dental procedure. This broken needle subsequently migrated to the lateral aspect of the neck, confirming that these 'migrations' do occur. We discuss the various causes, and clinical and dento-legal implications, as well as methods of treatment.

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### Introduction

It is estimated that 60,000 cartridges of local anaesthetic are used weekly in the USA for dental anaesthesia by infiltration or block injections.<sup>1</sup> The complication of needle breakage after an inferior alveolar nerve block is relatively rare in dental practice.<sup>2</sup> One of the first ever case series on dental needle breakage was published in 1928 by Blum, who reported 65 broken needles over a ten-year period.<sup>3</sup> The routine use of single-use, disposable stainless steel needles made from stronger alloys has decreased this complication.<sup>4</sup> Today, needle breakage during local anaesthesia may be attributed to a faulty needle, an incorrect anaesthetic injection technique or sudden movement by the patient in a direction opposite to the needle.<sup>5</sup> It is important to caution the patient against sudden movement during administration of the injection. The needle should not be redirected against tissue resistance while it is embedded in tissue, as this can cause breakage to occur.<sup>6</sup>

In the past, many practitioners have used shorter dental needles (25mm 30-gauge) for a block injection, but this practice should not continue as the needle must inevitably be inserted up to the hub and is not visible in these cases. Needles are manufactured with

the weakest point at the hub. Therefore, any needle chosen for any particular injection should be long enough that insertion to its full length is not required. Bedrock *et al.* recommended that a 27-gauge 35mm needle be used for all inferior alveolar nerve block injections.<sup>7</sup> The needle should be carefully inspected before use to look for any defects or bends in the metal, and should never be bent before use as is unfortunately commonly recommended.<sup>7</sup> Needle deflection upon injection has been studied extensively, and it has been found that smaller gauge needles are more easily deflected as they pass through the tissues.<sup>8</sup> Many dentists are also worried about pain with the use of larger needles, but it has been shown that there is no significant difference in pain perception produced by 25-, 27- or 30-gauge needles penetrating the tissues.<sup>9</sup>

### Case report

A 65-year-old patient was referred to the Department of Oral and Maxillofacial Surgery, Dublin Dental School and Hospital, with a history of atrial fibrillation, hypertension, asthma and an allergy to penicillin. Medications included warfarin (2mg od), a Ventolin inhaler and a beta-blocker (Cardicor 10mg od). The patient had



FIGURE 1: Orthopantomogram showing the fractured needle sitting high up on the ramus of the mandible on the right hand side.



FIGURE 2: Postero-anterior mandible view.



FIGURE 3: Lateral skull view.



FIGURE 4: Computer tomography view.

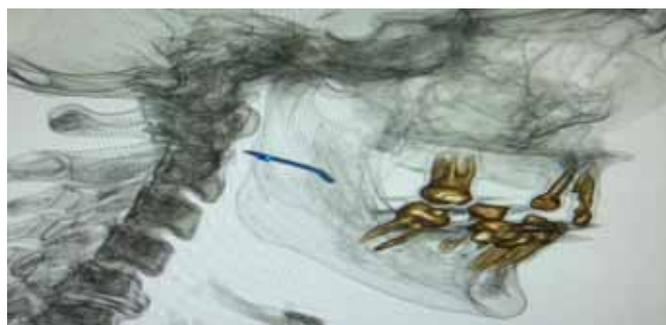


FIGURE 5: Three-dimensional computer tomography reconstruction view.



FIGURE 6: Posterior left hand side post auricular and neck area showing erythematous point where needle was lying under the skin.

been attending a private dental practitioner for treatment of a carious lower right second premolar. The dentist had administered one inferior alveolar nerve block injection and was in the process of administering a second when the needle broke at the level of the hub. A standard 35mm 27-gauge needle was used at the time. The needle end was not visible. The dentist contacted the Accident and Emergency Department of the Dublin Dental School and Hospital,

and the patient was transferred to the Department by taxi. The patient was assessed on arrival and was stable. An orthopantomogram and a lateral oblique radiograph were taken, and the needle was visualised on the right side of the ascending ramus (Figure 1). A postero-anterior view of the mandible was not taken, as the patient was distressed. The patient was cautioned against excessive jaw movements at the time to avoid the needle moving deeper into the tissue spaces. Intra-oral



FIGURE 7: Needle being removed.



FIGURE 9: Dental needle position for inferior alveolar block injection.



FIGURE 8: Location of inferior alveolar block injection showing direction of the needle.



FIGURE 10: Location of needle penetration for inferior alveolar block injection (lateral view).

examination did not reveal an obvious puncture wound and mouth opening was within normal limits. No pain or dysphagia was reported on examination. A decision was made to refer the patient to the National Maxillofacial Unit in St James's Hospital, Dublin, for further imaging including computed tomography (CT; axial and coronal views) with 3D reconstruction (Figures 2, 3, 4 and 5). This imaging localised the needle in the vicinity of the lingula (medial aspect of the mandible) deep to the medial pterygoid. The patient was admitted, and placed on 150mg clindamycin IV four times daily, 5mg dexamethasone IV, and chlorhexidine mouthwash twice daily. The patient remained in the hospital for two days. A decision was made to review the patient in two weeks when some scarring and fibrosis had occurred to stabilise the needle and facilitate its retrieval. Review was two weeks later in the outpatient department. The patient was complaining of pain behind the right ear. On examination, the needle had obviously migrated and was palpable just under the skin on the lateral aspect of the neck in the post auricular area (Figures 6 and 7). The needle spontaneously extruded on pressure and was removed using a fine haemostat. The patient was asymptomatic at the two-week review and mouth opening was within normal limits. The patient was discharged with no further complications.

## Discussion

### Correct technique for administration of an inferior alveolar nerve block

The correct technique involves a detailed knowledge of relevant anatomy. The landmarks for injection are the pterygomandibular raphe and the anterior ramus of the mandible 1cm above the occlusal line. The mandibular foramen usually lies at a point midway between the maximum concavity of the mandible on the anterior surface of the mandibular ramus and the maximum concavity of the posterior border of the ramus. These areas should be palpated with the index finger and thumb of one hand, while aiming to place the needle half way between the thumb and fingertip.<sup>10</sup> The needle should be level with the occlusal plane (1cm above) and half way posterior from the anterior ramus to the pterygomandibular raphe (Figures 8, 9 and 10). The needle should be advanced to just contact bone (20-25mm) but this should not be too forceful, because this in itself could cause needle breakage. Aspiration should be carried out before injecting slowly. If sited correctly, this injection should anaesthetise the inferior alveolar and lingual nerves. If bone contact cannot be felt the needle is sited too far back; it should be withdrawn slightly and angled more laterally towards the ramus. Possible reasons for failure include a bifid inferior alveolar nerve emerging from accessory foramina, or other

accessory innervation, which may arise from a sensory component of the mylohyoid nerve or the first cervical branches.

#### Localisation of the needle

Plain radiographs taken at right angles to each other are used as a first method of localisation of a broken needle, but 3D CT images are the gold standard to accurately establish needle position.<sup>4</sup> Many other methods of location have been described, including use of stereotactic devices and image intensifiers.<sup>11</sup> C-arm digital fluoroscopes involve placing a spinal needle through the tissues and taking multiple fluoroscopic images to accurately locate the needle.<sup>12</sup> Mima described an earlier version of this by monitoring and successfully removing the needle using x-ray TV.<sup>13</sup> Other operators have successfully used metal detectors but this would be a more unusual method.<sup>14</sup> Real time ultrasonography has also been described to locate a small metallic foreign body in the oral cavity.<sup>15</sup>

#### Is intervention necessary?

Patients may describe symptoms including dysphagia, pain and trismus, but others may be completely asymptomatic.<sup>14</sup> Some authors have advocated postponing the removal of the foreign body from the soft tissue space if there are no symptoms.<sup>16</sup> The boundaries of the triangular pterygomandibular space are laterally the mandibular ramus, medially the medial pterygoid muscle and the lateral pterygoid muscle superiorly. It communicates with the lateral pharyngeal, retromandibular and infratemporal spaces. The inferior alveolar nerve, artery and vein, and the lingual nerve, all lie in this space. Complications such as the needle migrating towards vital structures, including blood vessels or nerves, can occur.<sup>17</sup> There have been very few reports that document this occurrence in detail, although in McDonogh's paper the needle did migrate significantly into deeper tissue spaces.<sup>14</sup> Possible sites that could be affected by migration include the lateral pharyngeal space, where the styloglossus muscle, the ascending pharyngeal artery and the external carotid artery all lie.<sup>18</sup> Therefore, most authors recommend removal of the needle, to alleviate patient anxiety and decrease the possibility of further complications.<sup>19,20</sup> In this case the needle migrated, avoiding vital structures nearby.

#### Management

If a needle is broken during administration of an inferior alveolar nerve block:

If it is still visible:

- accurately define where the needle entry point is, e.g., 1cm above the last molar and 0.5cm medial to the ramus of the mandible; and,
- attempt retrieval with a fine artery forceps.

If it is not visible:

- again, accurately define the needle entry point with the mouth open (see above);
- reassure the patient;

- caution against excessive jaw movements, which may cause the needle to move deeper into the tissues;
- mark the site where needle penetration occurred with an indelible marker;
- arrange referral to a local maxillofacial unit by telephone and give the patient a brief referral letter;
- send the remainder of the needle and hub, and a fresh needle with the patient so an estimate of the length remaining can be made, and ask the hospital to photograph and return the fractured needle to the dentist if possible;
- write accurate and contemporaneous notes relating to the incident;
- retain the needle box and the invoice from the needle suppliers, and take a photo of the fractured needle if possible (as the fracture may be due to a manufacturing fault);
- follow up care of the patient by telephoning the consultant to see what his/her treatment included;
- arrange to review the patient by telephone;
- inform your dental defence company; and,
- discuss the management with your dental team (debrief).

#### Conclusion

Needle breakage in modern dental practice is a rare but stressful complication, which can be minimised by using adequate preventive measures as outlined above. Practitioners should routinely inspect dental needles before administering injections and minimise the number of repeated injections using the same needle. Migration of a needle deeper into the tissue spaces is a potential complication and we recommend removal of broken needles if at all possible.

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