

Tattooing and various piercing: anaesthetic considerations

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Purpose of review

Body art is increasing since the 1990s. Anaesthesiologists would be more and more confronted to patient with tattooing or piercing, or both. This review discusses the anaesthetic potential risks and complications observed with tattooing and piercing, their management and prevention.

Recent findings

Airway management during anaesthesia is of particular interest with oral jewellery. Patients often refuse to remove their piercing for fear of tract closure. There are no serious complications reported after epidural puncture through a tattoo, although any long-term consequence cannot be discarded yet. Even theoretical concerns are more and more debated.

Summary

Oral and nasal piercing is of particular concern because of the risks of swallowing and aspiration. Consequently, patients should be advised to remove piercing before anaesthesia. Emergency situations are especially risky and anaesthesiologists should be aware of the piercing removal techniques. In case of piercing loss, radiographies and fiberoptic endoscopy of the upper airways and digestive tracts should be performed to eliminate aspiration or swallowing of the foreign body. Epidurals should not be denied to parturients with lumbar tattooing. However, it seems still prudent to avoid direct tattoo puncture or when unavoidable, to nick the skin prior to inserting the needle through the tattoo.

Keywords

complications, general anaesthesia, piercing, regional anaesthesia, tattoo

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Introduction

'Body art' has become increasingly popular since the early 1990s and it has started to be practiced across many social and age groups [1,2]. It includes tattooing, piercing and scarification of the body in 'unconventional sites', ear lobes piercing and make-up being not considered as body art. Tattoo and piercing can lead to different complications, ranging from minor and transient to serious and irreversible such as infection, pain, inflammatory reactions or bleeding. However, there is no definitive information in literature about the possible risks of anaesthesia in patients with body modifications. This review discusses the anaesthetic potential risks and complications observed with tattoo and piercing, their management and prevention.

Piercing and anaesthesia

Body piercing is defined as 'a penetration of jewellery into openings made in body areas'. By comparison with

tattoos, piercing is not considered as permanent by the professionals of body art, because of the possible tract closure if the piercing is removed. Body piercing has increased tremendously since the end of the 1990s [2]. Previously identified exclusively with people outside mainstream society, body piercing is gaining widespread popularity, especially among adolescents and young adults, with a female predominance (46% of English women aged 16–24 compared with 13% of English men of the same age) [3]. Piercing can be placed anywhere on the body. The more frequent localizations are the earlobes and ear cartilage; the other parts of the body often pierced are eyebrows, nose, cheeks, lips, tongue, nipple, navel, and various genital sites. Whatever the localization, the material most commonly used for piercing is stainless steel and sometimes niobium, titanium, silver or gold to avoid allergic reaction to brass or nickel. Body piercing is performed in regulated and unregulated shops, jewellery shops, homes and a minority in physicians' offices. Generally, no antibiotic is used and conditions of sterilization and antisepsis vary widely. Reports

of side effects and complications associated with piercing are increasing. However, there is very little information in the literature about piercing and anaesthesia implications. It consists mainly of case reports that focus on interference between oral or nasal jewellery and airway management.

Oral jewellery

Oral jewellery included initially lip piercing, but tongue piercing has become more and more widespread. It constitutes a specific challenge for the anaesthesiologist. Table 1 [4–8,9*] summarized the main cases reported in the literature. Oyos [4] and Mandabach *et al.* [5] described healthy patients with tongue piercing who underwent a general anaesthesia. In these two case reports, one patient being ventilated with facemask and two others being intubated, no airway problem occurred. Two other cases reports specifically address localized bleeding at the tongue jewellery associated with direct laryngoscopy [6,7]. The first case was a woman profoundly hypoxemic in the recovery suite after a laparoscopic gynaecological procedure for which she had been intubated [6]. Hypoxemia was caused by laryngospasm after extubation. It responded to a positive airway pressure with mask and bag. It was caused by bleeding adjacent to a tongue stud. The piercing had been left in place because the patient claimed that it could not be removed. Kuczkowski and Benumof [7] reported oral hardware interfering with airway management in an obstetric patient. Because of a postpartum haemorrhage, the parturient required an emergent evacuation of retained fragments of placenta. The parturient presented with a tongue barbell but there was no time to remove it before the emergent general anaesthesia was performed. Direct laryngoscopy caused significant bleeding from the pierced surface of the tongue, but fortunately the tracheal intubation was successful at first attempt. The authors also noticed a tongue oedema at the time of extubation. Thus, oral piercing can induce tongue and pharyngeal oedema that might lead to airway obstruction. This case also shows that oral piercing can be problematic, especially in emergency situations if it is not mentioned to the anaesthesiologist or if one does not know how to remove it.

Dental trauma, such as fractures or fissures, is also another frequent complication of oral piercing (20%) [10]. It can be observed during general anaesthesia, when the patient has bitten down on the hardware when asleep and broken teeth.

Nasal piercing

Dhir and Dhir [9*] of a nasal piercing. The patient presented for laparoscopic cholecystectomy. Despite explanations of the risks and implications, she refused to remove any jewellery before the procedure. All jewellery was

Table 1 Case reports of anaesthetic implications with various piercing

References	Age/sex	Piercing	Time in place	Reason for not removing the piercing	Surgery	Anaesthesia	Complications
Oyos [4]	17/Female	Tongue ring	< 1 month	Patient refusal	Diagnostic laparoscopy	General anaesthesia with orotracheal intubation	None
Mandabach <i>et al.</i> [5]	19/Female	Tongue barbell	1 day	Not specified	Knee arthroscopy	Epidural converted to general anaesthesia with face mask ventilation	None
Wise [6]	21/Female	Navel, left nostril, dorsum of the tongue	Not specified	Patient refusal to remove the tongue ring	Emergency laparoscopic appendectomy	General anaesthesia with orotracheal intubation	None
Kuczkowski and Benumof [7]	Not specified/ Female	Tongue stud	Not specified	Impossibility of removing the piercing	Laparoscopic gynaecological procedure	General anaesthesia with orotracheal intubation	Postoperative laryngospasm secondary to bleeding coming from the tongue stud
Kuczkowski <i>et al.</i> [8]	27/Female	Tongue barbell	Not specified	No time to remove the piercing in emergency	Emergency postpartum surgery	General anaesthesia with orotracheal intubation	Tongue bleeding at the time of laryngoscopy and tongue oedema at extubation
Dhir and Dhir [9*]	18/Female	Nasal jewellery	Not specified	No time to remove the piercing in emergency	Emergent Caesarean section	General anaesthesia with orotracheal intubation	None
	65/Female	Nasal piercing	Not specified	Patient refusal	Laparoscopic cholecystectomy	General anaesthesia with orotracheal intubation	Missing nasal jewellery entangled in the nasogastric tube

taped and padded, including the left nosepiece. During surgery, a nasogastric tube was inserted in the left nostril and remained in place postoperatively. After transfer to the recovery room and removal of the tapes covering her jewellery, it was noticed that the nasal piercing was missing. Fiberoptic endoscopy under general anaesthesia was planned to locate the hardware. The nasogastric tube was thus removed to facilitate better access and the piercing was found entangled in one of the terminal openings of the nasogastric tube.

Another potential complication with nasal piercing during general anaesthesia was reported by Kuczkowski *et al.* in 2003 [8]. It concerned an 18-year-old woman requiring an emergency Caesarean section for placenta abruption at 25 weeks' gestation. There was no time for more than an abbreviated preanaesthetic evaluation and general anaesthesia was induced quickly. At the end of the surgery, a small displaced piece of nasal piercing was noted. Radiographs of the head and neck were negative. With the patient still under general anaesthesia, fiberoptic endoscopy was performed and did not find the missing piece. At the end, the patient's mother stated that her daughter wore her nasal pin without backing. Consequently, the patient was extubated and the post-operative course was uneventful. Those case reports highlight that precautions must also be taken with nasal jewellery during anaesthesia.

Common anaesthesia implications of all type of piercing

Wherever the piercing is localized, electrical burns can occur with electrocauterization if any body piercing is left in place during surgery. The piercing can be also infected and the infection can spread haematogenous to another site, especially at surgical site. These potential complications are two additional arguments to advocate the piercing removal prior to anaesthesia and surgery.

Management of anaesthetic complications with piercing and prevention

There is no consensus among authors on piercing removal as a routine practice before anaesthesia. In the light of all these case reports, we suggest that oral and nasal piercing be removed before general but also regional anaesthesia. Mandabach *et al.* [5] reported the case of a woman with a tongue piercing operated on for knee arthroscopy under epidural anaesthesia. Unfortunately, the patient appeared to panic and thus general anaesthesia was quickly induced. This case illustrates that one may never be sure that a regional anaesthetic technique will remain purely regional. Removing piercing jewellery before any anaesthesia is a safety consideration and it avoids some heavy investigations in case of intraoperative loss. Every piercing should be recorded during preanaesthetic evaluation. Moreover, anaesthesiologists should know how to remove it,

especially in the unconscious patient. Unfortunately, this is rarely the case: in a survey of 28 accident and emergency doctors, only six were able to accurately describe how to remove all commonly used types of piercing [11]. Since then, guides to piercing removal techniques have been published, particularly for tongue piercing [12*].

Another point is how to deal with a patient who refuses to remove oral piercing before anaesthesia, arguing that it will be impossible to reinsert it because of the high vascular and rapidly regenerating tissue. In that situation of tract closure fear, plastic sleepers or other protective devices can be placed before anaesthesia. It is of note that these sleepers still carry a potential risk of aspiration and are not radio-opaque. Consequently, their use should be discussed with the patient preoperatively. In one case report, an epidural catheter was passed through the hole of a tongue piercing to avoid its closure [13]. The epidural catheter was tied in a large loop and did not impede the laryngoscopy for oro-tracheal intubation. Other authors have described the use of an intravenous catheter to maintain the piercing tract patency [14].

If the piercing is left in place, direct pressure should be avoided. In this purpose, piercing should be tapped and padded before anaesthesia. Particular precautions must be taken with teeth and oral piercing. In case of general anaesthesia, teeth should be protected. At discharge, the oral cavity of the patient should be examined to look for any trauma.

In case of suspicion of aspiration or swallowing, all authors recommend performing, first, radiographies in anterior and lateral views of the head, neck, chest and abdomen. If negative, fiberoptic endoscopy of nasopharyngeal and oropharyngeal cavities, oesophagus, larynx and trachea should be implemented.

Tattooing and anaesthesia

The term tattooing comes from a Tahitian term (*Ta tatau*, meaning appropriate, balanced and fitting) [15*]. The technique consists in depositing ink pigment along the entire needle track through the epidermis into the dermis [16**]. Modern tattooing devices usually penetrate the skin 0.6–2.2 mm deep [17]. Only pigment that is in the dermis remains permanently [16**], whereas those deposited into the epidermis are progressively lost whereas the superficial layers peel away within a few weeks [17,18*]. In the past, pigments used to be inorganic (titanium dioxide, cadmium sulphide, chromic oxide, cadmium selenide, red cinnabar, iron oxide and carbon). Currently, more organic pigments are being used and the precise composition of tattoo inks remains unknown [16**,19*].

The prevalence of tattooing is about 25% in the United States population aged 24–50 years [1]. However, this prevalence does not seem to increase anymore. Indeed, a mild but significant decrease of tattooing amongst female undergraduate university students has been even noticed in two consecutive surveys between 2006 and 2001 (21 vs. 26%, respectively) [20]. Nevertheless, this information overall suggests that the management of a parturient with a tattoo has become quite frequent; in addition, amongst various ‘unconventional’ localizations, the lumbar site is no longer rare [16^{••},21,22].

Complications of tattooing

Several carcinogenic aromatic amides have been detected in tattoo inks. However, all evidence seems to come from in-vitro data and obtained following photodecomposition reaction after light amplification by stimulated emission of radiation (LASER) therapy and it remains unclear whether compounds embedded in the skin are biologically active [19[•]]. So far, association between tattoos and rare cases of skin cancers is thus considered coincidental [18[•]].

By contrast, cutaneous reactions to tattoos are not uncommon, including lichenoid, granulomatous, eczematous and pseudolymphomatous reactions. Such patterns may develop with highly variable delay after the tattooing procedure [23].

Infectious complications of tattooing included syphilis in the early part of the 20th century and more recently HIV disease and/or hepatitis [24]. Infective endocarditis related to tattoos appears extremely rare, contrarily to cases related to piercing [25]. Local infection with pustular lesions may also spread spontaneously in depth, as described in a single but impressive case report of a spinal epidural abscess that occurred 2 weeks after a tattoo on a buttock [26].

Several cases of superficial burn and pain in the area of the tattoo (containing iron oxide) have been also reported during MRI scanning [16^{••},24,27].

Of greater concern to anaesthesiologists is a (single) report of three patients who developed muscle atrophy adjacent to tattoos with electromyography patterns indicating possible brachial plexus involvement. The authors suggested that in some persons (and/or with some particular tattooing?), focal chronic neuromuscular dysfunction could occur, maybe as a result of immune-mediated reaction secondary to inflammatory changes or toxic effect of the pigment itself [28]. Although discussing this case report, Douglas and Swenerton [16^{••}] raised the question of whether a similar reaction could occur with epidurals, as chemically induced arachnoiditis has been described after epidurally administered local

anaesthetics containing preservatives. However, to our knowledge no other similar cases of neuromuscular dysfunction have been reported following tattooing with or without subsequent regional anaesthesia.

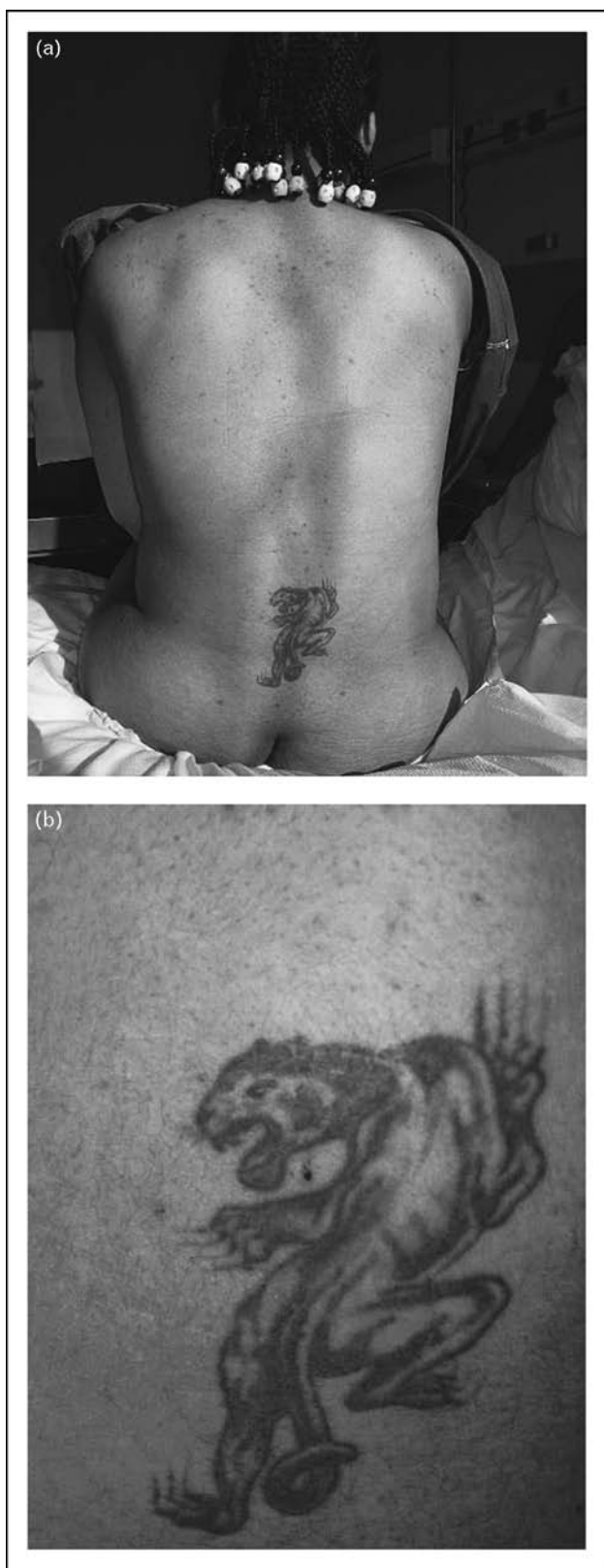
Only one case in the literature reported a minor complication after an epidural block performed at L2-L3 interspace through a colourful tattoo covering the entire back of the parturient [29]. Symptoms were tenderness and burning where the epidural catheter had been sited, several hours after the uneventful delivery. Localized L2-L3 interspace tenderness was confirmed by examination. Neurological examination was normal and the symptoms spontaneously resolved over the next 24 h. Douglas [30] and also Kluger [19[•]] suggested that these symptoms were more likely related to bruising from the epidural needle, a quite common complication also encountered in patients without tattoos. We also share this point of view.

Thus, to date, there are no convincing anaesthetic complications related to insertion of an epidural needle through a tattoo. However, some theoretical concerns have been raised because hollow needles may entrap tissue fragments (cores) as they pass to deeper structures. Nonstyletted large bore needles favour tissue coring [16^{••}], although even 25-gauge Quincke and Whitacre spinal needles have been shown to often produce some tissue cores; nonetheless, cores identified were mostly made of blood clot and fat, without epidermal tissue [31]. Moreover, only tattoo pigments that are in the dermis remain permanently and they do not stay ‘loose’. They are quickly assimilated by macrophages during the healing process and thus are unlikely to be freely mobilized by the needle or to migrate along the needle track. Therefore, both a dermatologist and a forensic pathologist questioned on the risk of providing epidural analgesia in patients with lumbar tattoos consider that there is actually no danger or, at least, that it has been clearly overstated [18[•],32[•]]. In a quite provocative letter to the Editor, Mavropoulos and Camann [32[•]] even described how a butterfly tattoo was used as a proxy to identify the bony processes of the patient’s spine for adequate mid-line placement during spinal anaesthesia.

Anaesthetic management

Preanaesthetic visit, when performed in advance, should record any tattoo noticed in the lumbar area. A clear anaesthetic management plan needs to be defined in agreement with the patient, after adequate information has been provided. It should be mentioned namely that no serious complications have been reported to date with epidurals, even when performed directly through the lumbar tattoo and, moreover, that theoretical risks of complications are more and more debated. However, as it is too early to discard any possibility for long-term

Figure 1 Photograph of lumbar midline tattoo with focus on the puncture site



(a) Lumbar midline tattoo, spreading from L3 to S1 vertebral interspace. (b) Focus on the puncture site located in a pigment free skin spot within the area of the tattoo. Reproduced with permission from [22].

Figure 2 Tattooing covering the entire back of the parturient, with no free skin spot available.



Reproduced with permission from [22].

consequence, we still currently advocate avoiding direct skin puncture with the needle through the tattoo by either selecting a free vertebral interspace, using a paramedian approach, or by finding a pigment free skin spot within the area of the tattoo (Fig. 1). When these options cannot be implemented (Fig. 2), a skin incision through the epidermis a few millimetres deep into the dermis prior to needle insertion should prevent any significant risk of tattoo pigment coring when entering the skin. In all cases, care must be taken to fully insert the internal stylet into the Tuohy needle prior to starting the puncture, to further reduce the risk of tissue coring.

Conclusion

The risk of airway and/or digestive tract aspiration, bleeding, trauma and oedema far outweigh the benefits of maintaining physical appearance or redoing the body piercing in case of tract closure. Thus, anaesthesiologists should advise patients to remove piercing, in particular oral and nasal jewellery, before general or even regional anaesthesia or admission to labour and delivery suite.

To date, there are no reports of serious complications resulting from spinal or epidural anaesthesia through a

tattoo and the theoretical risk is even more and more debated. Nonetheless, it seems prudent to still avoid direct tattoo puncture or, when unavoidable, to nick the skin prior to inserting the needle through the tattoo. Providing that these precautions are observed and adequate information is given, we currently consider that epidurals should not be denied to parturients with a lumbar tattoo.

References and recommended reading

Papers of particular interest, published within the annual period of review, have been highlighted as:

- of special interest
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Additional references related to this topic can also be found in the Current World Literature section in this issue (p. 456).

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