

USE OF NASOGASTRIC TUBES IN TRAUMA PATIENTS – A REVIEW

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Abstract

Traditionally, suspected basal skull fractures have been considered a relative contra-indication to inserting a nasogastric tube (NGT). In patients with basal skull fractures the Advanced Trauma Life Support protocol recommends that an orogastric tube (OGT) be inserted rather than a nasogastric tube (NGT). This article reviews the available literature. We conclude that in patients with suspected or confirmed basal skull fractures numerous case reports confirm that nasogastric tube insertion may lead to intracranial placement which, although the causal relationship is unclear, is associated with patient death.

Key Words: Trauma, Nasogastric Tubes, Intracranial Placement

Introduction

Traditionally, suspected basal skull fractures have been considered a relative contra-indication to inserting a nasogastric tube (NGT). In patients with basal skull fractures the Advanced Trauma Life Support protocol recommends that an orogastric tube (OGT) be inserted rather than a nasogastric tube (NGT) [1].

The potential for intracranial NGT placement has been confirmed in a cadaveric study [2]. We present a short review of published case reports of intracranial NGT placement and summarise the outcomes reported in the literature.

Methods

A Pubmed search strategy using the terms “nasogastric”, “intracranial” and “trauma” was used to identify relevant articles. A “Related article” search was also carried out. Apart from one article in French only articles with English text or abstracts were used. The papers were reviewed, although a few older articles could not be obtained in full. In these cases the abstracts were examined.

Results

We found abstracts and review articles referencing 23 cases of intracranial NGT placement. Most of these were in trauma patients with known or suspected basal skull fracture. [3-18] There were three reports of intracranial NGT placement in patients with pituitary tumours, [19-21] one in a preterm infant [22], and two in unconscious adult patients without significant mechanical trauma. [23,24]

Rahimi-Movaghar et al [12] described the insertion of a nasogastric tube in a 34 year old man who had been injured in a fall from height. A nasogastric tube was passed in the obtunded patient before CT demonstrated a fracture of the ethmoid lamina cribrosa through which the nasogastric tube had passed to lie in the brain with blood alongside it. The patient died within a few days, but the patient's other injuries are not described and the cause of death is not given. Castiglione et al [17] reported a young woman who was assaulted and sustained a severe head injury. An NG tube was passed and shown on plain radiograph to lie in the cranial cavity. Castiglione's paper is written from a medicolegal

and forensic viewpoint and describes the autopsy findings in some detail. In the case described the death was attributed to traumatic skull and brain injuries, but the extent to which the nasogastric tube contributed to these is not clear. The paper emphasizes that point, referring to other case reports in which patients died but where the cause of death was not recorded.

Reference	Mechanism	Outcome
Rahimi-Moghavar [12]	Trauma – fall from height	Death
Castiglione et al [17]	Trauma – assault with blunt instrument	Death possibly due to NGT
Fremstad JD, Martin SH [3]	Head trauma - RTC	Death attributed to NGT
Galloway DC, Grudis J [4]	Blunt trauma (RTA)	Died
Sacks AD [6]	Trauma – RTC, skull base fracture	Not stated
Wylar AR, Reynolds AF [8]	Trauma – fall from height	Died – intracranial NGT unlikely to have contributed
Pandey AK, Sharma AK et al [9]	Trauma - RTC	Died of head injuries
Guerra B, Slade TL [19]	Nasogastric tube inserted after craniotomy for pituitary adenoma	Died after four days
Bricard H, Carmes C [20]	Unknown pituitary adenoma. Inserted during colonic cancer surgery.	Death due to brain injury caused by NGT
Hande A, Nagpal R [21]	Inserted following transsphenoidal surgery	Died of bronchopneumonia
Seebacher J, Nozik D et al [10]	Blunt trauma (RTA)	Tube removed. Died perioperatively during craniotomy with arterial bleeding.

Table 1. Summarises those patients who died following NGT insertion.

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The morbidity resulting from intracranial insertion of nasogastric tubes in trauma patients is not well recorded, partly because it is difficult to differentiate between injury caused by the trauma and injury caused by the intracranial tube placement [17]. Three papers [3,17,20] attributed the patient's death directly to intracranial placement of an NGT. One patient died during craniotomy to remove the tube [10]. Death was considered to be caused by other injuries in two cases [9,8]. In the other reports we examined where patients had died, the cause of death was not clearly attributed to either the NGT or to other injuries. Table 1 summarises those patients who died following NGT insertion.

Survivors

In patients who survived intracranial NGT insertion, there was a broad spectrum of neuro-logical outcomes. Genu et al [5] reported a 53 year old man who was injured in a motorcycle accident. At CT, after his NGT was placed, he was found to have a large subarachnoid haemorrhage, cerebral oedema, pneumocephalus, nasoethmoid and sphenoid sinus fractures,

fractures of the left temporal bone, left zygomatic fracture, and an intracranial NGT. The tube was removed but the patient developed a right hemiplegia which had not resolved when he was discharged 80 days after his injury.

Fletcher et al [8] reported two patients in whom intracranial nasogastric tubes were removed and who had reasonable outcomes. One was a 16 year old boy, involved in a road traffic collision, with supraorbital and maxillary fractures who was blind before the nasogastric tube was inserted. After intracranial NGT insertion he developed diabetes insipidus and a dense left hemiparesis, which resolved slowly. At three months he had returned to his previous activities despite a "minimal" hemiparesis. The other patient was an 80 year old man with gunshot injury whose intracranial NGT was removed in sections; he was discharged with no neurological sequelae, but was blinded by orbital injuries.

Gregory et al [7] reported a 22 year old man who was injured by an exploding lorry tyre. He had fractures of the right orbit, right frontal bone, nasal bones, and left maxillary sinus. CT confirmed intracranial NGT placement. The NGT was removed and a craniotomy performed at which two dural lacerations were repaired. He was discharged "without further difficulty". All these patients received broad spectrum antibiotic prophylaxis.

Ferreras [11] reports a patient who had a cranial NGT after complex maxillofacial trauma but was discharged after the tube was removed with no neurological sequelae. Van den Anker et al [22] reported an NG tube placed intracranially in a preterm infant; it was removed with antibiotic cover and there were no neurological complications. Table 2 lists the patients who survived intracranial NGT placement.

Limitations of review

Although there are twenty-three case reports of inadvertent intracranial placement of NGTs, we do not know how many were not reported. Despite this, given the enormous number of cases of trauma world wide this almost certainly remains a very rare occurrence, albeit an avoidable one. It is also not clear how intracranial NGT placement alters outcome in many of these patients, who invariably have significant head injuries.

At-Risk Patients

Trauma patients in this review who had intracranial NGT placement tended to have cribriform plate fractures or multiple skull fractures. It has been suggested that anatomical distortion by other skull fractures may alter the path of an NGT during insertion and thus increase the risk of intracranial penetration through another injury [22]. The accepted technique of inserting an NGT straight back in to the nose therefore may not prevent intracranial insertion. Clinical findings and suspicion based on the mechanism of injury may not correlate with the risk of intracranial penetration of an NGT, as was highlighted in the report of an NGT placed intracranially through an undiagnosed tumour following bowel surgery [20], and the epileptic patient in whom an NGT was placed through an old cribriform plate perforation [24]. However, this type of intracranial NGT placement in patients without an acute skull fracture must be very rare. The correct path of an NGT is shown in Figure 1, and intracranial placement is shown in Figure 2.

Conclusions

In patients with suspected or confirmed basal skull fractures numerous case reports confirm that nasogastric tube insertion may lead to intracranial placement which, although the causal relationship is unclear, is associated with patient death. An orogastric tube should be placed, under direct vision where possible [1]. Nasogastric tubes if needed should be placed under

Reference	Mechanism	Outcome
Cornett MA, Paris A et al [23]	Loss of consciousness following electrocution	NGT removed at craniotomy. Survived with left hemiparesis, cognitive and linguistic impairment.
Borovich B, Braun J et al [13]	Two trauma patients	One patient died, but was expected to die from other injuries. The other made a satisfactory recovery after the tube was removed in sections.
Genu PR, de Oliveira DM et al [5]	Blunt trauma	NGT removed. Discharged with right hemiplegia.
Gustavsson S, Albert J et al [16]	Head injury - RTA	Survived with visual field defect, probably not caused by NGT
Arslantas A, Durmaz R et al [15]	Paediatric trauma. NGT caused left frontal lobe damage, removed with antibiotic cover	Discharged "in good health"
Fletcher SA, Henderson LT et al [18]	Two trauma patients. Both tubes removed by craniotomy	"Acceptable" recovery considering premorbid status
Gregory JA, Turner PT et al [7]	Trauma	Patient survived "without further difficulty"
Ferreras J, Junquera LM, Garcia-Consuegra L [11]	Trauma – RTC. Tube removed immediately through nose.	No complications
Van den Anker JN, Baerts W et al [22]	Preterm infant. Tube removed with antibiotic cover	No complications
Freij RM, Mullett STH [24]	Epilepsy, unknown old cribriform plate perforation	Death due to meningitis and bronchopneumonia

Table 2. Lists of patients who survived intracranial NGT placement.



Figure 1. Correct path of an NGT

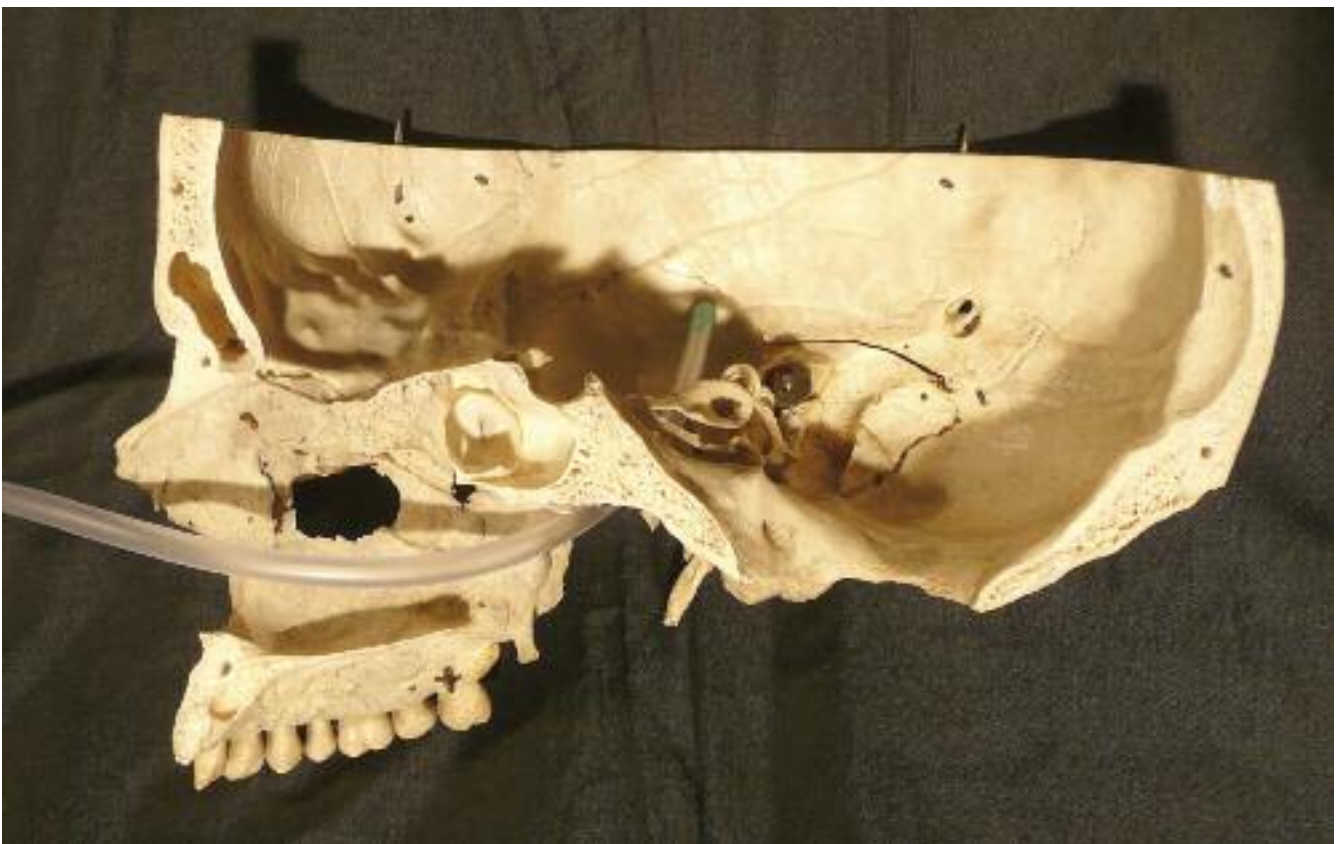


Figure 2. Intracranial placement of an NGT

direct vision [4] or delayed until imaging has confirmed that there is no basal skull fracture. The insertion of a nasogastric tube should be avoided if there is a suspicion of basal skull fracture or midface fracture - an orogastric tube should be used instead.

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