Inadvertent Intracranial Placement of a Nasogastric Tube in a Patient With Severe Craniofacial Trauma: A Case Report

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Nasogastric intubation is a well-established procedure in many clinical situations. Insertion of a nasogastric tube (NGT) is generally a routine, simple task, although it is often carried out under emergency conditions and on unconscious or uncooperative patients. The introduction of an NGT is often recommended after initial stabilization to remove and evaluate gastric contents, decrease the likelihood of aspiration, and prevent gastric dilation from the ileus and for a variety of other conditions that are common after multiple injuries.1 Like other clinical procedures, it is not free of risk or complications, such as pressure necrosis of the tip of the nose, nasal hemorrhage, rhinitis, conjunctivitis, ear symptoms, sinusitis, pharyngitis, rupture of esophageal varices, laryngeal injuries, pulmonary hemorrhage, bronchopleural fistula, pneumothorax, pneumomediastinum, pneumonia, ventilatory failure, massive aspiration, perforation (bronchus, esophageal, nasopharyngeal, duodenal, gastric, or rectal), and death.2,3 One complication that is not very frequent, but can be catastrophic, is the inadvertent intracranial placement of an NGT.

The inadvertent introduction of an NGT into the intracranial cavity was first described by Martinelle et al4 in 1974. Since then, 33 additional cases have been reported in the international literature.5,6 A complex craniofacial fracture is the most common antecedent in such cases. Intracranial NGT placement has been reported after pathosis or surgery of the base of the skull,7,8 and iatrogenic cases have also been documented.9-13

Our purpose was to describe a case of severe craniofacial fracture in which the NGT was positioned intracranially. We also hope to alert anesthesiologists and surgeons treating traumatized patients with craniofacial injuries of the possible hazards associated with nasogastric intubation.

Report of a Case

A 53-year-old man was injured when riding his motorcycle without his helmet. Initially, he was admitted to the local emergency hospital for treatment of head and face trauma.

On admission, his vital signs were unstable; he had an orotracheal tube, and he was breathing with the support of an air mask unit. He also had an NGT (Sidplast Ind Com Ltd, Rio Largo, AL, Brazil) placed. His pulse was 120/min and his blood pressure was 180/70 mm Hg; he was able to react to pain stimuli. The patient was able to move only his left leg and arm. The physical examination of his head and face revealed a deep wound in the left side of his forehead,
peri-orbital edema and ecchymosis in his left orbit, rhinor- 
hea, and a flattening of the left side of his face, and his 
facial height appeared to be increased. Intraoral exami-
nation showed an edentulous maxilla and mandible and mo-
bility of the mandible.

High-resolution computed tomography (CT) scanning of 
the brain revealed a traumatic subarachnoid hemorrhage, 
brain concussion, diffuse cerebral edema, pneumocephaly,
and an image of an intracranial NGT (Fig 1). Apparently the 
NGT, after insertion into the nose, had crossed the cribr-i-
iform plate and reached the posterior cranial fossa (Figs 2A, 
B, 3A, B). Further examination of the CT scans revealed a 
nasoethmoid fracture, fracture of the sphenoid sinus, frac-
ture of the left temporal bone, bilateral mandibular frac-
tures, fracture of the left zygoma, and presence of blood 
within all of the facial sinuses (Figs 4A, B). At this point, the 
NGT was removed and the patient was taken to the intensive 
care unit. After 2 days, he underwent a procedure for 
the installation of a cerebrospinal fluid drain and a trans-
ducer to monitor the intracranial pressure. During the fol-
lowing days, the patient developed hemiplegia of the right 
am and leg and iliac-femoral deep venous thrombosis. An-
ti clotting therapy was then administered. After 35 days, the 
patient was taken to the operating room, where the facial 
fractures were treated using rigid internal fixation; on the 68th 
day, he underwent a surgical procedure to treat a chronic 
frontal subdural hematoma. On the 80th day he was dis-
charged, and he still had the same neurologic complications.

Discussion

The placement of an NGT is a common practice in 
trauma surgery that in some cases does not receive 
due attention. The physical examination is often a 
poor predictor of tube malposition, especially in a 
patient with an obtunded mental state. The place-
ment of an NGT is often first evaluated by aspiring 
fluid or insufflating air and auscultation of the abdo-
men to induce a "pseudo confirmation gurgle." Both 
maneuvers may yield false-positive results.14

Radiographic imaging is commonly used to confirm 
the position of the tube and is strongly recommended

![Image 1](figure1.png)  
**FIGURE 1.** Computed axial tomography showing pneumoencepha-
los and a localized intracranial nasogastric tube.  

![Image 2](figure2.png)  
**FIGURE 2.** (A, B) Computed tomography (superficial 3-dimensional reconstruction) showing the intracranial course trajectory of nasogastric 
tube.  
before the tube is used for enteral feeding or the instillation of drugs or other material. However, the radiograph may be misinterpreted. Despite its occasional fallibility, radiographic confirmation should be mandatory before material is lavaged through an NGT. This could minimize the rate of inadvertent insertion of NGT and the associated potential morbidity and mortality. Radiographs from cases of intracranial placement of NGT show the tubes coiling in the vault of the skull, apparently not within the brain substance. When such a misplacement has been established, an emergency CT study is essential, with the provision of adequate antibiotic coverage.

In the patient with craniofacial trauma, and particularly in the patient with cerebrospinal fluid rhinorrhea, insertion of the gastric tube through the nasal cavity may be hazardous. Bouzarth report 5 cases of intracranial NGT insertion, in which spinal fluid leakage was noted in only 1 case. In dealing with patients with obvious facial and basal skull fractures, the emergency physician should be alerted to the fact that the region of the cribriform plate or sphenoid sinus may

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**FIGURE 3.** (A, B) Computed tomography (volumetric 3-dimensional reconstruction) showing the intracranial course trajectory of nasogastric tube.


**FIGURE 4.** (A) Computed coronal tomography showing fracture of the sphenoid sinus and fracture of the left temporal bone. (B) Superficial 3-dimensional reconstruction showing a nasoethmoid fracture, bilateral mandibular fracture, and fracture of the left zygomatic bone.

be fractured, and this could lead to a communication between the nasopharynx and the intracranial cavity, regardless of whether the dura is lacerated.\textsuperscript{1,17} Blind nasogastric intubation is contraindicated in this situation to prevent contamination or injury to the intracranial contents.\textsuperscript{1,18} Gustavsson et al\textsuperscript{19} emphasize that the apparently easy introduction of an NGT does not necessarily mean that the tube has entered the stomach, in patients with severe maxillofacial trauma.

If NGT placement is chosen, gastric intubation should be performed under fluoroscopic guidance,\textsuperscript{20} endoscopic guidance,\textsuperscript{20} or direct vision.\textsuperscript{21} The orogastric tube is another option.\textsuperscript{21} To prevent intracranial placement, Sliwa and Marciniak\textsuperscript{22} recommended that tubes passed nasally be inserted and advanced perpendicularly to the face. Lipov and Sosis\textsuperscript{23} report that the use of the fiberoptic bronchoscope for NGT placement is useful in patients with basal skull fractures without midface or nasal trauma. A larger tube seemed to be safer than the small-caliber tube.\textsuperscript{20}

The consequences of inadvertent NGT positioning within the cranial cavity are serious, with a reported mortality rate of 64%. Also, severe complications may occur in the form of hemiparesis, intracranial bleeding, decerebrate posturing, respiratory arrest, suctioning of brain parenchyma, blindness, loss of the sense of smell, meningitis, decreased mental status, and persistent cerebrospinal fluid fistula.\textsuperscript{24} Cerebral damage caused by NGT cannot always be clearly proved because it is difficult to distinguish it from the damage caused by initial trauma. Establishing the cause and effect between death and intracranial NGT is therefore problematic.\textsuperscript{6}

Some authors recommend craniotomy with removal of the previously segmented tube under direct visualization.\textsuperscript{24} Others advocate retrieval through the nose.\textsuperscript{1,5,18,19,25} Ferreras et al\textsuperscript{5} state that there is no available scientific evidence to suggest that either technique offers any prognostic advantages. In any case, the best approach is clearly to prevent this complication.

Thus, it seems prudent not to routinely insert tubes into the nose of patients with severe maxillofacial trauma and clinical or radiographic evidence of a basilar skull fracture unless the integrity of the base of the skull is ensured. If NGT placement is necessary, one should take special precautions as outlined to prevent intracranial placement of the NGT.

References