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Percutaneous endoscopic gastrostomy for patients with severe cerebral injury

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Early enteral nutrition improves the outcome of severely injured patients. To provide enteral nutrition, various methods are available. In a restrospective study we analysed the outcome of 24 severely traumatized patients (mean ISS = 44), in whom a percutaneous endoscopic gastrostomy (PEG) was used for enteral nutrition. All patients had been admitted to the intensive care unit with major cerebral injury. The mean duration of intensive care treatment and the in hospital stay were 28 and 71 days, respectively. PEG was introduced 14 days after hospital admittance. Enteral nutrition through the PEG was administered for 45 days. Four patients died, 8 patients were discharged from the hospital while being fed via the PEG and 12 patients resumed normal feeding and the PEG was removed. Three severe complications occurred; 1 patient aspirated massively and died; in 2 patients intra-abdominal leakage of the enteral nutrition occurred. Both patients recovered from this complication. We conclude that because of the advantages of early enteral nutrition on the one hand and the drawbacks of nasogastric feeding tubes on the other, in injured patients with severe cerebral damage, PEG placement is justified, despite the risk of complications. © *1998 Elsevier Science Ltd. All rights reserved*

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Introduction

It is commonly accepted that the gastrointestinal tract is to be used to provide nutritional support whenever possible. The most important advantage in comparison to total parenteral nutrition is a reduction in infectious complications in general, especially in high risk surgical patients[1–3]. Other advantages include a reduction in nursing time, lower costs and the absence of a central venous line (necessary for parenteral nutrition), which is commonly associated with various complications.

Severely injured patients on mechanical ventilation require nutritional support. In a case of severe cerebral injury postpyloric feeding may be indicated, because of delayed gastric emptying due to atony[4,5]. This can be achieved by a naso-jejunal tube or by a percutaneous gastro-jejunostomy (PEG/J). Although full calorie support by piperval feeding tubes has been reported in known improved patients, others recommend a needle catheter jejunostomy, especially when a laparotomy is performed[6], problems with adequate placement and frequent dislodgement of such tubes often lead to insufficient nutritional intake, especially during mechanical ventilation[4,8].

In the St Elisabeth Hospital, Tilburg, the Netherlands, severely injured patients with cerebral injury receive total parenteral nutrition during the period of gastric atony. In this period, a nasograstric tube is placed for decompression. Subsequently, this tube is used for enteral nutrition as soon as gastric emptying normalizes. When neurological recovery takes more than about 14 days and oral intakes can not be started, a percutaneous endoscopic gastrostomy (PEG) is placed to provide enteral nutrition. In this study, we have analysed the results of this policy. Our objective was to assess the benefits of early PEG placement in this specific group of patients in relation to complications we met.

Patients and methods

Between January 1986 and January 1993, 24 severely injured patients, admitted to the intensive care unit, received a PEG for enteral nutrition. All of the patients had been involved in a traffic accident, either as car driver, motorcyclist, cyclist or pedestrian, but in nearly all cases a car had been involved. There were 22 males and 2 females, mean age was 33 years (range, 9–80 years).

The mean injury severity score was 44 (range, 27–59). Major cerebral injury was present in all patients (HTI $\geq$ 4). Cerebral computer tomographies had been performed in all patients. Injury to the thorax was present in 15 patients, abdominal injury in 4, fractures of the spine or pelvis in 3, upper extremity fractures in 10 and lower extremity fractures in 13.

Initially, all patients were mechanically (hyper-) ventilated. A central venous catheter was placed for

vascular access and pressure control. All patients initially received a nasogastric tube for gastric decompression. Craniotomy was performed in 1 patient, 3 patients underwent emergency laparotomy (2 for splenectomy, 1 for a rupture of the diaphragm). Early fracture stabilization was performed. One patient needed surgical treatment of extensive lacerations.

During the period of emergency treatment, TPN was administered through the central venous catheter to deal with the post traumatic hypermetabolic state. Periodically, neurological and gastrointestinal functions were evaluated. As soon as gastric function had recovered and the output of the nasogastric tube had decreased, this tube was used to provide enteral nutrition. When neurological recovery took more than about 14 days, the nasogastric feeding tube was replaced by a PEG for long-term nutritional therapy. The push method was used in all patients to perform PEG placement[9]. The operation was performed under general anaesthesia, if indicated in combination with other surgical procedures.

Results

PEG was successfully placed in all 24 patients (*Table I*). The mean period between ICU admittance and PEG placement was 14 days (range, 1–28 days). PEG placement was performed either as a solitary procedure ($n = 3$) or it was combined with tracheostomy ($n = 13$), fracture treatment ($n = 3$) or split skin grafting ($n = 1$).

In 23 patients, nutritional support through the PEG could be started the day after placement. In 1 patient, gastric retention remained and a second PEG was placed for the introduction of a transpyloric tube to achieve simultaneous gastric suction and jejunal feeding.

Major complications of PEG occurred in 3 patients. In 2 patients, intraperitoneal leakage of enteral nutrition was found, for which a laparotomy was performed. A Witzel gastrostomy was applied after removing the PEG. One patient develpoed an aspiration pneumonia, 21 days after the PEG had been placed and died subsequently. Three minor complications were seen: 1 stitch fistula and one superficial infection, that healed with cleansing and 1 occluded PEG that needed replacement.

Other comlications, not associated with the PEG, in this group of patients included ARDS ($n = 7$), pneumonia ($n = 3$), cardiac congestion ($n = 1$). Five patients ultimately developed the persistent vegetative state (PVS).

The mean hospital stay was 71 days (range, 23–246 days). Twenty-eight days were spent on the ICU. PEG was used for 45 days (range, 2–226 days). Four patients died, 3 as a consequence of their injuries, and 1 after aspiration. Of the remaining 20 patients, 8 were discharged with PEG nutrition after a mean of 75 days (range, 2–226 days). Twelve patients resumed normal swallowing and PEG could be removed after a mean of 42 days (range, 11–109 days).

Table I.

Patients	*Number*
Male : female	22 : 2
Age	33 (9–80)
ISS	43 (27–59)
HTI	≥4
Additional injury:	
Thorax	15
Abdomen	4
Spine or pelvis	3
Upper extremity	10
Lower extremity	13
PEG placement	
Solitary procedure	3
Tracheostomy	17
Fracture treatment	3
Skin graft	1

Discussion

PEG was originally introduced to apply a gastrostomy simply[10] and is generally used to provide enteral nutrition in 3 categories of patients: elderly malnourished patients, neurological patients with impaired swallowing mechanisms and oncological patients, especially those who need surgery or irradiation of the oropharyngeal region[11–13]. The indications for PEG placement appear to be changing. With increasing frequency, nasogastric feeding tubes are replaced by PEG to provide semi- long-term enteral nutrition because of various advantages of a PEG in daily use. Some recently published studies have focused on these advantages and describe a comparison with nasogastric feeding tubes. Park and colleagues compared the efficiency of nutritional support provided by PEG and nasogastric tube. They found that patients with a PEG had an intake of 93 per cent of the prescribed amounts of nutrition, whereas the intake of patients with a nasogastric tube was only 55 per cent[14]. Wicks found an improvement in feeding condition after PEG placement in patients who had previously been fed by nasogastric tube for a long time[15]. The same conclusion was drawn by Allison, who describes an improvement in neurological function after PEG placementin patients with a cerebro-vascular accident[16]. In contrast to a nasogastric feeding tube, PEG does not interfere with the swallowing mechanism, which reduces the possibility of choking, especially when oral feeding is initiated during neurological recovery. The cosmetic advantage of a PEG, that can be worn invisibly underneath the patients' clothes, may play a psychological role during recovery.

Nevertheless PEG placement is not without risks, the above mentiond benefits should outweigh these risks. PEG placement is associated with a mortality rate of 1–3 per cent, major complication rates of 3–9 per cent and minor complication rates of 5–45 per cent[17–23]. The risk of aspiration, frequently associated with nasogastric feeding tubes, has not been elimi-

nated with PEG placement[24-26]. Nevertheless, PEG has been accepted when long-term enteral nutrition is desired. In the case of severely injured patients with cerebral damage, it is difficult to predict how long recovery will take and what will be the final physical and mental outcome. Therefore, it is difficult to predict, at the time of hospital admission, how long a patient will need nutritional support and if a special feeding device that carries risks for the patient is justified.

For the majority of injured patients, invasive techniques will not be necessary to provide enteral nutrition. Nevertheless, some authors advocate postpyloric enteral nutrition, starting the day after the injury and provided by needle catheter jejunostomy (NCJ) or PEG/J[1,6,8,27]. In our opinion, the consequence will be that many patients are unnecessarily exposed to the risks of these invasive techniques (PEG/J or NCJ). During the first days after injury, these patients could have been fed enterally, by a nasojejunal tube or parenterally, because closed head injury is always accompanied by temporary gastrointestinal dysfunction[4,5,28]. Enteral feeding can be started as soon as gastric emptying returns and it can be provided through the nasogastric tube. The gastric route is preferable for several reasons. Firstly, it is the most physiological way of feeding. Secondly, jejunal feedings are associated with a high incidence of gastrointestinal complaints (nausea, cramps, abdominal distention)[29-32] and finally postpyloric feeding tubes like PEG/J and nasojejunal tubes are associated with a high risk of tube dislocation[4,8]. Patients, who fail to recover neurologically for a prolonged period, may need a more aggressive feeding approach. Like others, we think PEG is the method of choice in these patients[33,34]. Placement of a PEG is frequently performed in combination with other surgical procedures like tracheostomy or fracture treatment.

In the group of 24 patients described, PEG was generally placed when neurological recovery took more than 14 days. Twelve patients, out of 20 survivors, who resumed oral nutrition, had been fed through their PEG for a mean of 42 days. Eight other survivors (5 with PVS) were still being bed through the PEG at the time of their discharge from hospital. The number of complications in this group of patients was high, compared with figures mentioned in the literature. The major complications, e.g. intra abdominal leakage of nutritional fluids in 2 patients, were directly related to the technique that was used for PEG placement and led to adjustment of our technique (both patients recovered from this complication). Mortality and minor complications were similar to figures mentioned in the literature. Therefore, we think the benefits of PEG placement outweigh the risks in patients with cerebral injury who do not recover within 14 days. We plead for a liberal use of PEG in this select group of patients.

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