《Original Article》

Intermittent Oral Catheterization (IOC) for Dysphagic Stroke Patients

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脳卒中患者の摂食嚥下障害に対する間欠的口腔カテーテル栄養法 (IOC)

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要 旨：摂食嚥下障害に対する間欠的口腔カテーテル栄養法 (IOC) は、咽頭反射の減弱した症例に適応がある。我々は、脳卒中に伴う摂食嚥下障害 29 例に対して本法を適用し、23 例 (79.3%) で鼻腔カテーテルを抜去でき、20 例 (69.0%) を嚥下障害食 (SF) または正常に近い食餌にもっていくことができた。これは対象群と比べて有意に ($p < 0.01$) 良い成績であった。IOC は摂食嚥下障害に対する治療管理法の一つとして普及が期待される。(リハ医学 1997; 34: 113-120)

Abstract: Intermittent oral catheterization (IOC) is a potential treatment for patients with decreased pharyngeal reflexes. The method was tested on 29 hemiplegic stroke patients with feeding dysphagia. In the experimental group, 23 patients (79.3%) became nasal catheter-free, and 20 patients (69.0%) were able to consume 'specially cooked foods for feeding dysphagia' (SF) or almost normal foods, a significantly higher incidence ($p < 0.01$) than that for the control group. IOC should prove a useful adjunct to other therapy and management methods used with feeding dysphagia. (*Jpn J Rehabil Med* 1997; 34: 113-120)

Key words: intermittent oral catheterization (IOC) (間欠的口腔カテーテル栄養法), tube feeding (チューブ栄養), feeding dysphagia (摂食嚥下障害), stroke (脳卒中), therapy (治療)

Objectives

'Intermittent oral catheterization' (IOC), the therapy and management method proposed by Funahashi et al.,¹⁾ is used to treat neurologically handicapped children with feeding dysphagia. It was devised to protect against aspiration pneumonia and to counter malnutrition. Briefly, a Neraton catheter is passed orally into the stomach 3 to 6 times daily, and liquidized foods are administered through it.

Initially the method was intended for severely handicapped children with severe dysphagia, but

now has been adapted for and further expanded to stroke patients by our group,^{2,3)} Honda et al.,⁴⁾ and Saitoh et al.⁵⁾ Taylor et al.⁶⁾ devised a similar method they called 'oro-esophageal tube feeding.' Although they described the method, they did not provide details of their results. We here report the results of using 'IOC' to treat hemiplegic stroke patients with feeding dysphagia.

Patients and Methods

IOC was used to feed 29 dysphasic hemiplegic stroke patients with decreased pharyngeal reflexes

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Table 1 Patient Groupings in this Study

	IOC group (<i>n</i> =29)		Control group (<i>n</i> =30)	
Type of stroke	Subarachnoidal haemorrhage	5	Subarachnoidal haemorrhage	6
	Intracerebral haemorrhage	18	Intracerebral haemorrhage	11
	Cerebral infarction	5	Cerebral infarction	13
	Other	1		
Main complication	Aphasia	3	Aphasia	2
	Dementia	17	Dementia	7
	Bl. recurrent nerve paresis	1	Apraxia	2
	Locked-in syndrome	1	Bl. recurrent nerve paresis	2
	Inability to keep mouth closed	3	Locked-in syndrome	2
	History of tracheotomy	12	History of tracheotomy	13
Age	67±10 yrs		68±9 yrs	
Paralytic side	Rt. 11 Lt. 9 Bl. 9		Rt. 9 Lt. 9 Bl. 12	
Type of dysphagia (Kubota et al.)	Pharyngeal type	10	Pharyngeal type	8
	Oropharyngeal type	19	Oropharyngeal type	22
Onset to the first therapeutic application	First day of IOC application : 106th day (26-327) of disease (average)		First day of therapy for dysphagia (except indwelling nasal catheter) : 96th day of disease (average)	
Duration of IOC	96 days (average)			
Days of hospitalization	200 days (average)		254 days (average)

Fig. 1 Use of IOC for a hemiplegic stroke patient with feeding dysphagia

(Table 1). Previously, all the subjects had been fed through an 'indwelling nasal catheter' (naso-gastric tube).

With recovery of the pharyngeal reflex the diameter of the oral catheter could be decreased (Figs. 1, 2). Catheters of small diameter usually are soft and difficult to insert orally. We therefore used a special catheter with an attached stylet that provided sufficient firmness to pass easily through the pharynx without bending in the oropharynx (Fig. 3).

Patients who showed recovery of their feeding or swallowing functions were fed increased amounts

Fig. 2 Sizes of the rubber feeding catheters used in IOC

Standard size (No)	3	4	5	6	7
External diameter (mm)	3.5	4	5	6	7

The internal diameter is approximately half the external diameter. Total length 125 cm. Manufactured by Imamura Co.

and coarser grades of 'specially cooked foods for feeding dysphagia' (SF) through the oral catheter.

We followed changes in swallowing functions

Fig. 3 (a) Special catheters with a stylet (b). Catheters with external diameters of 3 mm. Total length 32.5 cm. Manufactured by Create Medic Co. (c) Rubber feeding catheter with stylet

through clinical examinations or videofluorography. The soft palatal reflex was induced by using a small wooden bar (tips covered with cotton, diameter, 3.0 mm) to contact the buccal wall. The pharyngeal reflex also was induced by using this bar to make contact with the pharyngeal wall. Both reflexes were evaluated as follows: negative, decreased; slight grimaces, slightly decreased; grimaces but does not show symptoms of nausea, within normal limits; grimaces shows symptoms of nausea.

The water drink test was evaluated by Kubota's method.⁷⁾ When a cup of water could be consumed smoothly at one time without choking, swallowing ability was judged to be profile 1. Inability to drink the total amount of water because of frequent choking was judged to be profile 5.

Changes caused by different feeding styles were

Fig. 4 Changes in feeding treatment for dysphagic patients: Coarseness of the grade of special foods for feeding dysphagia (SF) and the respective diameters of the catheters used ($n=29$)

Fig. 5 Changes in feeding treatment in the control group ($n=30$)

The percentage (36.7%) for the 11 patients (A'+B') in the control group is significantly lower ($p<0.01$) than that (70.0%) for the 20 patients (A+B) in the subject group (Fig. 4).

observed and compared for the group receiving IOC and the control group of 30 patients not treated with IOC (Table 1). The control group comprised stroke patients with feeding dysphagia who had been treated in our hospital over a 5 year period (1988-1992) when IOC was used only with handicapped children. This was the matched control to the subjects group. (Except for the percentage of dementia, no significant difference was found between these groups with the Chi square test and F examination.)

None of the patients in the subjects or control group received speech therapy during this study. We used the F examination as a statistical analysis.

Results

Twenty-three (79.3%) of 29 patients who received IOC became nasal catheter-free and 20 (69.0%) were able to take SF or almost normal foods after treatment (Fig. 4).

Four patients (13.8%) who started IOC and were taking SF during the initial stage of treatment, developed aspiration problems during treatment; therefore, their feeding was managed by indwelling

Fig. 6 Improvement of pharyngeal phase function after the use of IOC ($n=29$)

Fig. 7 Improvement of pharyngeal passage times after the use of IOC ($n=9$)

nasal catheter feeding. Two patients (6.9%) changed to IOC during the initial stage of treatment, but their aspiration problems did not improve. One subsequently was treated with venous hyperalimentation (IVH), the glottis being closed after treatment. The other subsequently was treated with indwelling nasal catheter.

In the control group, at the time of discharge, only 11 (36.7%) of the 30 patients had reached the level where SF could be fed orally. This was a signifi-

Fig. 8 Type of change after the use of IOC

cantly lower incidence ($p < 0.01$) as compared with that for the subject group (Fig. 5). Soft palatal reflexes showed slight recovery in 5 (32.0%) and pharyngeal reflexes slight recovery in 16 (64.0%) of the 25 patients in the subject group (Fig. 6).

Passage time through the pharynx was shortened in 5 recent patients examined by videofluorography (Fig. 7) and symptoms of the oral phase of swallow also were slightly ameliorated (Fig. 8).

Other disorders such as drooling, choking, and difficulties during the 'water drinking test' also were lessened after the use of IOC (Fig. 8).

Discussion

1. The indication for and feasibility of IOC

IOC is a feasible therapy for hemiplegic stroke patients with swallowing difficulties who cannot easily advance from using an 'indwelling nasal catheter' to the ingestion of 'specially cooked foods for feeding dysphagia' (SF). There are indications for the use of IOC with dysphagic stroke patients who have undergone unavoidable nasal catheter feeding for more than one month because of poor, or lack of, swallowing ability for SF.

The method is ideal for patients with decreased

Fig. 9 IOC as seen in fluoroscope-photos

When the oral catheter is inserted, its tip passes through the oral cavity, making stronger contact with the pharyngeal wall at a right angle (a) as compared with the nasal catheter (b). The oral and pharyngeal effects on the production of the swallowing reflex are predictable.

pharyngeal reflexes. When the oral catheter is inserted, its tip passes through the oral cavity making stronger right angle contact with the pharyngeal wall than does a nasal catheter. Moreover, the oral and pharyngeal efferent nerve effects on producing the pharyngeal or swallowing reflex are

predictable (**Fig. 9**). The feeding-swallowing abilities of these patients improve as their reflexes recover.

The combined use of IOC and SF has the following effects: The oral-phase function is improved by taking SF into the oral cavity, and compensation for

the hypofunction of the pharyngeal phase increases.

The stimulation produced when the catheter is passed through the oral-cavity has a good effect on the oral-phase function. Stimulation of swallowing, caused by the insertion of the catheter 2 to 3 times a day, also may increase the patient's consciousness.

Indwelling nasal catheter feeding is a widely used method for patients with feeding dysphagia, but it may decrease the pharyngeal reflex because the catheter remains in contact with the pharyngeal wall. A disuse syndrome that involves swallowing also may occur. There are a number of other problems with this method; heavy feeling, contact dermatitis, decrease of saliva, a tendency to cause regurgitative esophagitis, and a tendency for pseudomonas bacteria to remain in the pharynx.

IOC may eliminate many of the negative effects of the nasal catheter.

It is indicated for home care of patients with feeding dysphagia if the family is willing to cooperate.

2. The limits of IOC

Many patients with dysphagia have serious complications such as the aspiration of saliva into the trachea or gastro-esophageal reflux when aspirating or changing position, both of which cause aspiration of gastric acids that harm the lungs. In extreme cases, when IOC is continued, there may be no change in the frequency of aspiration pneumonia.

In some cases, gastrostomy may eliminate aspiration; but, aspiration pneumonia is reported to be a problem even after resorting to this method,⁸⁾ therefore it is not the best means of avoiding pneumonia. Closure of the glottis, laryngoectomy, and other surgical procedures may be necessary.

3. New important findings concerning IOC

Initially we did not realize that it was better to place the catheter tip in the esophagus rather than in the stomach. Later Taylor et al.⁶⁾ advocated the esophageal route, as did Fujishima,⁹⁾ because the drip speed is faster than when the catheter tip is in the stomach (50 ml/min), and diarrhea is decreased as compared with the stomach method. Fujishima⁹⁾ also concluded that esophageal peristalsis becomes stronger when the catheter tip is placed in the esophagus rather than in the stomach.

He also stressed that oro-esophageal tube feeding

(Which he called the 'O-E method') was a compensatory not a therapeutic method.⁹⁾ Many of our patients were treated with SF used in parallel with IOC, but those who showed functional recovery were treated only with IOC.

Ito¹⁰⁾ reported a method of 'intermittent self tube insertion via the nasal route to the stomach.' This nasal route however is not physiological, whereas our oral route is. There are some advantages to Ito's method. When the gag reflex proves strong, it is impossible to make an oral insertion, whereas nasal insertion is possible.

We believe that the risk of misinserting the IOC into the trachea is less than with nasal catheter feeding. Taylor et al.⁶⁾ reported there were no misinsertions in their subjects, and we also had no misinsertions in our series. IOC therefore is a safe method when used without bending in the oral cavity.

When there is sensory disturbance in the tracheal region or gastro-esophageal reflux, caution may be needed. IOC should not be used in cases of Zenker's diverticulum or cervical osteophytes.^{5,6)}

4. Classification of IOC terminology

Saitoh et al.⁵⁾ proposed that IOC, the O-E method of Taylor et al.,⁶⁾ and Ito's method¹⁰⁾ be called intermittent tube feeding (ITF). Fujishima⁹⁾ proposed indicating first the region of catheter insertion then the location of its tip by the following combinations: Oro-Esophageal, Oro-Gastric, Naso-Esophageal, Naso-Gastric (1992, personal communication). Adding the 'I' of 'Intermittent' gives the respective terms: IOE, IOG, INE, and ING. IOC can be used as a general term for IOE and IOG. When insertion is performed by the patient, the word 'Self' could be added to the term, e.g., Ito's method could be called 'Self-INE.' When the catheter is kept continuously in place the term 'Intermittent' can be replaced by 'Continuous,' giving COE, COG, CNE, CNG. Lastly, there is the difference between the terms 'tube' and 'catheter.' A tube is defined as a long hollow utensil. A catheter is a pliant, tubular surgical utensil used to extract (introduce) liquid substances from (into) body cavities; moreover, it is defined as a 'surgical probe.' The term 'catheter' therefore cannot easily be dropped. Clearly, there must be further classifi-

cation of these terms.

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