Table 1. Diagnostic criteria for CIPO proposed by the Research Group of the Ministry of Health, Labour and Welfare

Definition of chronic intestinal pseudo-obstruction (CIPO)

Chronic bowel obstruction not explained by structural abnormalities

Criteria for chronic intestinal pseudo-obstruction (CIPO)

Must include all of the following four points:

1. Onset of one or more symptoms of bowel obstruction* at least 6 months prior to the diagnosis

   AND

2. One or both of the following for the previous 12 weeks

   a. Abdominal bloating

   b. Abdominal pain

   AND

3. Dilatation and/or air-fluid level of the intestine on abdominal X-ray, echo and/or CT imaging

   AND

4. No evidence of structural disease (including by upper and lower gastrointestinal endoscopy, computed tomography, barium enema, and small-bowel follow-through) that could explain the dilatation and/or air-fluid level of the intestine

   * Symptoms of bowel obstruction include: abdominal pain, nausea, vomiting, abdominal bloating, abdominal fullness, lack of gas and/or passing gas

Important Notice

1. Congenital and/or onset under 15 years old must be excluded. Only adult onset is included
2. Surgical history, except surgery for CIPO, within the 6 months prior to the diagnosis must be excluded to rule out Ogilvie syndrome
3. To define CIPO at two levels: primary CIPO or secondary CIPO. Primary CIPO consists of three types: the myogenic type, neurogenic type and idiopathic type. Secondary CIPO consists of two types: the systemic sclerosis (SSc) type and unclassified type
4. Family accumulation may exist
5. Neuropathy such as problems with urination may exist
6. Some psychosocial disorder may be present

Table 2. Patient questionnaire sent to 378 institutions belonging to the JSGE

I. Patient information

Sex : Male Female

Age (y. o) : -14 15-19 20-29 30-39 40-49 50-59 60-69 70-79 80-

II. Clinical presentations at the first hospital visit

Abdominal pain for the previous 12 weeks :	Yes	No
Vomiting for the previous 12 weeks :	Yes	No
Abdominal bloating for the previous 12 weeks :	Yes	No
Dilatation of the bowels on Radiological Imagings :	Yes	No
Disease duration :	More than 6 months	Within 6 months
Type of CIPO :	Primary	Secondary
If secondary CIPO :	Secondary to SSc	Secondary to others

III. Treatment

Selected method of treatment : Diet Medication Surgery Others No treatment

Medication drugs : Multiple answers allowed

Mosapride Erythromy Pantothenic Metocloprami Sulpiride
Domperid Daikenchuto** Somatostatin Kanamy Metronidaz
Polymixin Probiotics Itoprid Calcium polycarbophil
Magnesium Other laxatives Loperamide Albumin tannate
Dimethico PPI H2RA Mucosal protective drugs

Note: * Mosapride is the 5-HT4 receptor agonist. ** Daikenchuto is the Herbal medicine.

Table 3. Disease type of a total of 160 CIPO cases

Classification of CIPO	Case (%)
1) Primary CIPO	117 (73.1)
2) Secondary CIPO	41 (25.6)
a) SSc	23 (56.1)
b) Non-SSc	18 (43.9)
DM	4 (9.8)
MCTD	3 (7.3)
SjS	1 (2.4)
Amyloidosis	2 (4.9)
Others	8(19.5)
3) Unknown	2 (1.3)

Note: SSc; Systemic sclerosis, DM; Dermatomyositis,
MCTD; Mixed-connective tissue disease, SjS; Sjögren syndrome

Table 4. Clinical presentations at the first hospital visit [n=160]

Clinical presentations	Cases (%)		
Clinical symptoms	**Yes**	**No**	**Unknown**
Abdominal pain	107 (66.9)	53 (33.1)	0 (0)
Vomiting	81 (50.6)	79 (49.4)	0 (0)
Abdominal bloating	156 (97.5)	4 (2.5)	0 (0)
Abdominal pain and/or bloating	157 (98.1)	3 (1.9)	0 (0)
Radiological imaging findings	**Yes**	**No**	**Unknown**
Dilatation and/or air-fluid level of the bowel	154 (96.2)	3 (1.9)	3 (1.9)
Disease duration	**More than 6 months**	**Within 6 months**	**Unknown**
	141 (88.1)	16 (10.0)	3 (1.9)

The number (%) of the CIPO cases that fulfilled all the diagnostic criteria, including abdominal pain and/or bloating, and dilatation and/or air-fluid level of the bowel, and disease duration of more than 6 months, was 138 (86.3).

Table 5. Selected method of treatment [n=160]

Treatment	Cases (%)
Medication	135 (84.4)
Diet	107 (67.1)
Surgery	36 (22.5)
Others	46 (28.8)
Home parenteral nutrition	33 (20.6)
Endoscopic decompression	4 (2.5)
Ileus tube placement	2 (1.3)
Enema	1 (0.6)
No treatment	1 (0.6)

Table 6. Medication drugs used for treatment [n=160]

Drugs	Case (%)	Drugs	Case (%)
Mosapride citrate*	101 (57.4)	Metronidazole	18 (10.1)
Daikenchuto**	83 (51.1)	Itopride	16 (9.0)
Magnesium oxide	69 (43.1)	Dimethicone	12 (7.4)
Probiotics	62 (42.0)	Calcium polycarbophil	11 (6.9)
Erythromycin	41 (26.6)	Kanamycin	10 (5.9)
Proton pump inhibitor (PPI)	45 (24.7)	Somatostatin analogue	7 (4.3)
Pantothenic acid	36 (23.9)	Loperamide	5 (2.7)
Metoclopramide	34 (23.4)	Sulpiride	5 (2.7)
Mucosal protective drugs	23 (12.3)	Polymixin B	3 (2.7)
Domperidone	20 (11.2)	Albumin tannate	3 (1.6)
H2 receptor antagonist (H2RA)	19 (11.2)	Other laxatives	45 (25.0)

Note: * Mosapride is the 5-HT4 receptor agonist. ** Daikenc

厚生労働科学研究費補助金難治性疾患克服研究事業
慢性特発性偽性腸閉塞症の我が国における疫学・診断・治療の実態調査研究
分担研究報告書

9. 慢性特発性偽性腸閉塞症の適切な治療指針の検討

分担研究者　稲森　正彦　（横浜市立大学附属病院臨床研修センター　講師）

研究要旨：これまで本疾患の治療法に関しては対症療法が中心に行われてきたが、その治療指針に関する十分な検討はなされていない。今回、我々は国内外での現状から、現在選択される内科的、外科的治療の現況把握と、段階的な治療指針の作成を行った。

A．はじめに

慢性偽性腸閉塞症は、器質的な閉塞起点を認めないにも関わらず、消化管内容の通過障害を認める疾患群であり、再発緩寛を繰り返しつつ、長い期間をかけて進行性にQOLの低下を引き起こすことを特徴とする。その原因により特発性と、強皮症、糖尿病や薬剤性などの続発性に分類されるが、慢性偽性腸閉塞症は異なる疾患群の総称であることからも、これまで国内外で診断基準が確立しておらず、治療法についても十分な検討がなされていなかった。

B．治療指針

治療第一段階

慢性偽性腸閉塞症の診断がなされた場合、当該患者の併存疾患や投薬歴などから、特発性か続発性かを判断する。続発性慢性偽性腸閉塞の内、原疾患の治療への対応で偽性腸閉塞症状の改善が期待できる者は、その治療を最優先とする。具体的には、糖尿病、甲状腺機能低下症や一部のアミロイドーシス、感染症や腫瘍に併発したもの、薬剤性などは原疾患の治療や原因薬物の中止によって症状改善が期待できる群である。ただし、多くの慢性偽性腸閉塞症患者は治療可能な基礎疾患を持たないのが現状である。

第二段階

以前に本邦で唯一偽性腸閉塞の適応症があったシサプリドであるが、現在は販売中止になっている。従って、現状では患者の症状に応じて便秘症あるいは下痢症としての一般的な治療を行うことが第一段階となる。

具体的には

下剤としてのマグネシウム製剤

腸内細菌のコントロール目的の乳酸菌製剤

などが選択される。

第三段階

上記の基礎治療に反応がない場合、消化器疾患の診療経験の豊富な専門医への転送あるいは相談が望ましい。第二段階で使用された薬剤に加えて、症状に応じて下記薬剤の併用が行われる。

各種緩下剤
ジメチコン
消化管運動促進薬としてのモサプリド、大建中湯、パントテン酸、メトクロピロミド、イトプリド、スルピリド
などが選択される

第四段階
第二、第三段階の治療が奏功しない多くの場合、交代性の便秘下痢を認めるようになる。この場合、薬剤コントロールに難渋することが多く、当該疾患の診療経験の豊富な消化器病専門医への転送が望ましい。使用される薬剤としては第二、第三段階の薬剤に加えて

ポリカルボフィルカルシウム
止痢薬としてのタンニン酸アルブミン、ロペラミド
消化管運動促進薬としてのエリスロマイシン
などが選択される。

第五段階
これらの治療に抵抗性を示す場合、当該疾患の診療経験の豊富な消化器病専門医の管理のもと、時に入院加療が必要となる。これまでの薬剤に加えて

腸内細菌のコントロール目的にポリミキシンB、メトロニダゾール、カナマイシン
ソマトスタチンアナログ製剤
低残渣の経腸栄養剤
などが使用される。

上記治療に抵抗性を示す場合、病変が範囲により、外科的治療が検討される。病変が広範囲におよぶ大腸小腸型の慢性偽性腸閉塞では治療効果が乏しい例が多いが、大腸限局型の慢性偽性腸閉塞症ではその原因疾患によらず比較的良好な治療成績が報告されており、外科的治療の適応となる。具体的には、結腸切除術あるいはストマ造設術が選択される。海外では腸管移植が最終的な治療法として報告されているが、合併症や長期予後の面から十分な治療効果が見込まれるに至っていないのが現状である。

C．おわりに

慢性特発性偽性腸閉塞の全国調査の結果から、治療のアルゴリズムの素案につき提案を行った。疾患概念，診断基準の普及と共に，病型病期にあわせたこれらの治療の今後の評価が必要であろう。

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E．健康危険情報
なし

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1. 論文発表
なし

2. 学会発表
なし

III. 研究成果に関する刊行一覧表

研究成果に関する刊行一覧表

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Ⅳ. 研究成果の刊行物・別冊

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ORIGINAL ARTICLE

Nationwide survey on adult type chronic intestinal pseudo-obstruction in surgical institutions in Japan

Tadahiko Masaki · Kenichi Sugihara · Atsushi Nakajima · Tetsuichiro Muto

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Abstract
Background No appropriate management of chronic intestinal pseudo-obstruction (CIP) has been established.
Patients and methods The clinicopathological parameters of 103 cases collected by a nationwide questionnaire study were reviewed.
Results The CIP cases were primary in 86 (83%) cases and secondary in 15 (15%) cases. The age of onset of the primary type was significantly younger than that of the secondary type ($p = 0.011$). The diseased segments of the bowel were the large bowel in 60 (58%), the small bowel in 17 (17%), and both in 23 (22%) cases, respectively. Abdominal distension and pain were common symptoms regardless of the types of the diseased bowel; however, constipation was frequently seen in the large bowel type ($p = 0.0258$). Vomiting and diarrhea were seen with marginally higher frequency in the small bowel type ($p = 0.0569$, 0.0642). Surgical treatment was most effective in the large bowel type, less effective in the small bowel type, and least effective in the large and small bowel type. The prognosis of the primary CIP was significantly better than that of the secondary CIP ($p = 0.033$).
Conclusions The segments of the diseased bowels should be considered in determining the indications for surgical treatments in CIP patients.

Keywords Chronic intestinal pseudo-obstruction · Surgical treatment · Total colectomy

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T. Masaki (✉)
Department of Surgery, Kyorin University, 6-20-2 Shinkawa, Mitaka City, Tokyo 181-8611, Japan
e-mail: masaki@ks.kyorin-u.ac.jp

K. Sugihara
Department of Surgical Oncology, Tokyo Medical and Dental University, 1-5-45 Yushima, Bunkyo-ku, Tokyo 113-8519, Japan
e-mail: k-sugi.srg2@tmd.ac.jp

A. Nakajima
Department of Gastroenterology, Yokohama City University, 3-9 Fukuura, Kanazawa-ku, Yokohama 236-0004, Japan
e-mail: nakajima-tky@umin.ac.jp

T. Muto
Cancer Institute Hospital (Ariake), 3-10-6 Ariake, Koto-ku, Tokyo 135-8550, Japan
e-mail: muto@jfcr.or.jp

Introduction

Chronic intestinal pseudo-obstruction (CIP) is a rare, but a disabling disease that significantly affects patients' quality of life [1]. Abdominal pain and distension are common symptoms, and nausea, vomiting, constipation, and diarrhea are also seen with various frequencies. The etiology and cause of CIP is not clarified, and no appropriate management strategy has been established [1]. The idiopathic type CIP (CIIP) is noted in most pediatric cases and small bowel transplantation has been attempted recently in Western countries [2]. However, adult type CIP has not been extensively studied. Therefore, a nationwide survey was conducted to evaluate the clinicopathological characteristics of adult type CIP in Japan.

Patients and methods

A questionnaire form was sent to 421 qualified colorectal surgeons belonging to Japan Society of Coloproctology

Questionnaire on Chronic Intestinal Pseudo-obstruction

I. Basic informations

Gender	Male	Female			
Date of birth	(yyyy.mm.dd)		Unknown		
II. Clinical course until consultation					
Age of onset	_____yrs		Unknown		
Symptoms at onset	Nausea	present	absent	unknown	
	Vomiting	present	absent	unknown	
	Constipation	present	absent	unknown	
	Diarrhea	present	absent	unknown	
	Abdominal pain	present	absent	unknown	
	Abdominal distension	present	absent	unknown	
	Others				
Type of CIP	Primary	Secondary			
In case of Secondary	SSc-associated(PSS)	Others			
Treatment	Dietary Tx	yes	no	unknown	
	If yes, please describe details				
	Pharmacological Tx	yes	no	unknown	
If yes, please mark the drugs used	mosapride, erythromycin, pantothenic acid, metoclopramide, sulpiride, Domperidone, somatostatin analogue, Daikenchuto, Kanamycin, Metronidazole, Polymyxin B, bifidobacterium, Itopride, Polycarbophil calcium, magnesium oxide, other laxatives, Albumin tannate, Loperamide, Dimethicone, PPI, H2RA, mucosal protective drugs, others				
	PsychoTx	yes	no	unknown	
	If yes, please describe details				
	Surgical Tx	yes	no	unknown	
	If yes, please describe surgical Operation date	(yyyy.mm.dd)			
	Other Tx	( )			
III. Status after consultation					
Date of consultation	(yyyy.mm.dd)				
Symptoms at consultatic	Nausea	present	absent	unknown	
	Vomiting	present	absent	unknown	
	Constipation	present	absent	unknown	
	Diarrhea	present	absent	unknown	
	Abdominal pain	present	absent	unknown	
	Abdominal distension	present	absent	unknown	
	Others				
Diseased segments	Rectum, Colon, Ileum, Jejunum, Duodenum, Stomach, Esophagus, Unknown				
Medical Tx	Dietary Tx	yes	no	unknown	
	If yes, please describe details				
	Pharmacological Tx	yes	no	unknown	
If yes, please mark the drugs used	mosapride, erythromycin, pantothenic acid, metoclopramide, sulpiride, Domperidone, somatostatin analogue, Daikenchuto, Kanamycin, Metronidazole, Polymyxin B, bifidobacterium, Itopride, Polycarbophil calcium, magnesium oxide, other laxatives, Albumin tannate, Loperamide, Dimethicone, PPI, H2RA, mucosal protective drugs, others				
	PsychoTx	yes	no	unknown	
	If yes, please describe details				
Surgery					
Date of surgery	(yyyy.mm.dd)				
Procedures					
Surgical complications					
Effectiveness of surgery	present	absent	unknown		
Others					
Pathological findings (Biopsy, Resected specimen)					
Neurogenic abnormalities	no	yes ( )			
Myogenic abnormalities	no	yes ( )			
Other findings	( )				
Symptoms after surgery					
	Nausea	present	absent	unknown	
	Vomiting	present	absent	unknown	
	Constipation	present	absent	unknown	
	Diarrhea	present	absent	unknown	
	Abdominal pain	present	absent	unknown	
	Abdominal distension	present	absent	unknown	
	Others				
Prognosis					
alive Date of last follow-up	(yyyy.mm.dd)				
dead Date of death	(yyyy.mm.dd)				
Cause of death	CIP				
	Others( )				

Fig. 1 Details of the questionnaire

(JSCP) in December, 2009. The details of the questionnaire are shown in Fig. 1.

The study concept was approved by the institutional ethical committee in Yokohama City University, to which one of the co-authors (A.N.), who received the intractable disease research program grant from the Ministry of Health, Labour and Welfare of Japan, belonged.

Two hundred four (48%) surgeons responded by June, 2010, and 166 (81%) of them recognized CIP. One hundred three cases were collected from 57 surgeons (28% of responders). The number of cases was one in 37, two in 10, three in 3, four in 4, five in 2, and ten in 1 institution. CIP was defined according to the criteria shown in Table 1. Gender, age of onset, type of CIP (primary or secondary), segments of the diseased bowels (small intestine, large intestine, or both), the treatments before and after consultation at each institution, symptoms at consultation, the effects of surgical treatment, pathological findings in the resected specimens (neurogenic or myogenic abnormalities), and the patient's prognosis were reviewed. The clinical and pathological parameters were compared with reference to the type of CIP and the classification of the diseased bowel.

Statistical analysis

The Chi-squared test was used for comparing the distribution of categorical data, and Student's *t* test was used for continuous variables. The PASW Statistics 18 software package (SPSS, Chicago, IL) was used for these analyses, and p values <0.05 were considered to be statistically significant.

Quantification theory section 3 (Hayashi's quantification methods) was used to show the associations among the categorical data in the questionnaire. The categorical data were scored and plotted on a 2-dimensional scattered graph using the Excel Questionnaire software package, Taiko Ver.4.05 (ESUMI Co., Ltd., Tokyo, Japan) to visualize the associations between various categories. Categories were assumed to be likely to coexist when the plots of the categories were located in the same area. The survival time was calculated from the age of onset until the age of the last follow-up or death of any cause. The survival curves were plotted using the Kaplan–Meier method, and the survival rates were compared using the log-rank test.

Results

Demographic parameters

The types of adult CIP were primary in 86 (83%) cases and secondary in 15 (15%) cases. The causes of the secondary

Table 1 Definitions of CIP

Clinical presentations:
1. More than 6 months' duration of obstructing symptoms of the gut
2. At least 3 months' duration of abdominal pain and distension
Radiological findings:
1. Bowel dilatation or air-fluid levels shown by abdominal X-ray, ultrasonography, or computed tomography
2. Absence of any lesions occluding the gut shown by contrast radiography, endoscopy, or computed tomography
Additional findings:
1. Age of onset ≥15-year old (congenital cases should be excluded)
2. Acute intestinal pseudo-obstruction (Ogilvie syndrome) should be excluded
3. Classified into primary and secondary cases. Primary cases are classified into neurogenic, myogenic and idiopathic types. Secondary cases are classified into systemic sclerosis (SSc) associated and non-SSc associated types
4. Presence of familial occurrence is not mandatory
5. Obstructing symptoms indicate abdominal pain, distension, nausea, vomiting, constipation, or cessation of flatus
6. Neurogenic disorders such as dysuria, or psychiatric disorders may accompany in some cases

cases were systemic sclerosis (SSc) in 3 cases and others (non-SSc) such as amyloidosis, diabetes mellitus, or Parkinson disease in 8 cases. The age of onset of the primary type was significantly younger than that of the secondary type ($p = 0.011$), and among the secondary type the age of SSc cases was younger than that of non-SSc cases. The diseased segments of the bowel were the large bowel (the large bowel type) in 60 (58%) cases, the small bowel (the small bowel type) in 17 (17%) cases, and both (the large and small bowel type) in 23 (22%) cases. The age of onset was not significantly different among the types of the diseased bowels (Table 2).

Figure 2 shows the associations between symptoms at consultation and the types of the diseased bowels in the primary CIP cases. Abdominal distension and pain were common symptoms regardless of the types of the diseased bowels; however, constipation was frequently seen in the large bowel type ($p = 0.0258$). Vomiting and diarrhea were seen with marginally higher frequency when the small bowel was involved ($p = 0.0569$, 0.0642).

Figure 3 shows the scatter graph of each category among the types of the diseased segments and symptoms at consultation. Categories are likely to coexist when the plots of the categories are located in the same area. Nausea and vomiting tended to occur simultaneously. Furthermore, abdominal pain, distension and constipation tended to occur simultaneously. There was also a close association between constipation and the large bowel type.

Table 2 Demographic parameters

Gender		
Men	46 (45%)	
Women	56 (54%)	
Unknown	1 (1%)	
Type		
Primary	86 (83%)	
Secondary	15 (15%)	
SSc	3 (20%)	
non-SSc	8 (53%)	
Diseased segment		
Large bowel	60 (58%)	
Small bowel	17 (17%)	
Both	23 (22%)	
Unknown	3 (3%)	
Age of onset (years)		
Type		
Primary	43 ± 3	
Secondary	60 ± 5	$p = 0.011$
Diseased segment (years)		
Large bowel	50 ± 3	
Small bowel	41 ± 5	NS
Both	42 ± 5	

Treatments

The treatments before and after consultation were shown in Table 3.

Most were treated with medication therapy, but psychotherapy was rarely done before and after consultation. Surgical treatment was done in about two-thirds of cases after consultation in this series. The details of surgical treatment are summarized in Table 4. Total colectomy was the procedure of choice for the large bowel type. Figure 4 shows the efficacy of surgical treatment according to the classification of the diseased bowels. Surgical treatment was most effective in the large bowel type, less effective in the small bowel type, and least effective in the large and small bowel type.

Thirty-two of 86 primary CIP cases involved the small intestine. These cases were assumed to be chronic idiopathic

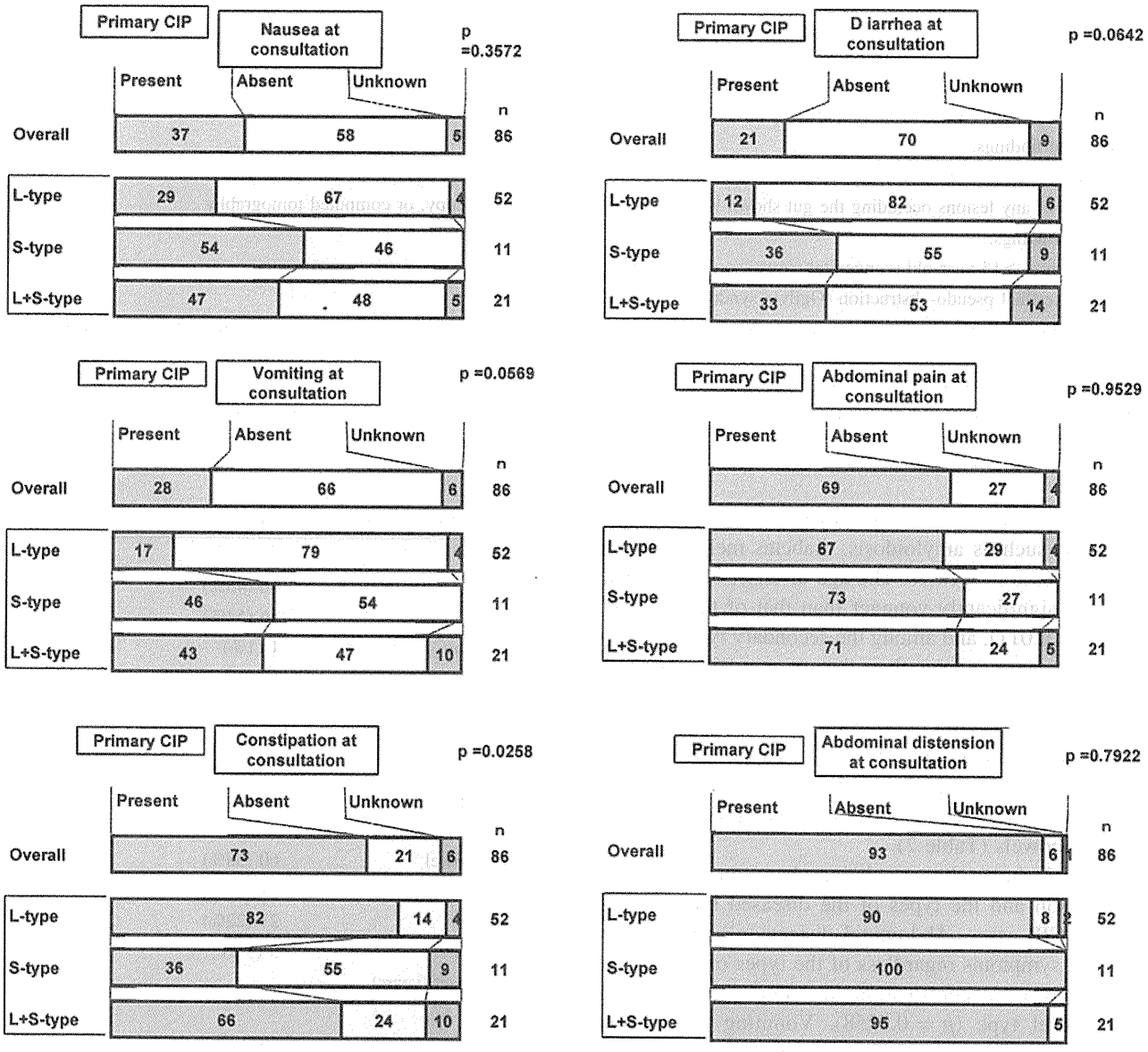

Fig. 2 Symptoms at consultation in the primary CIP cases L-type, the large bowel type; S-type, the small bowel type; L + S-type, the large and small bowel type

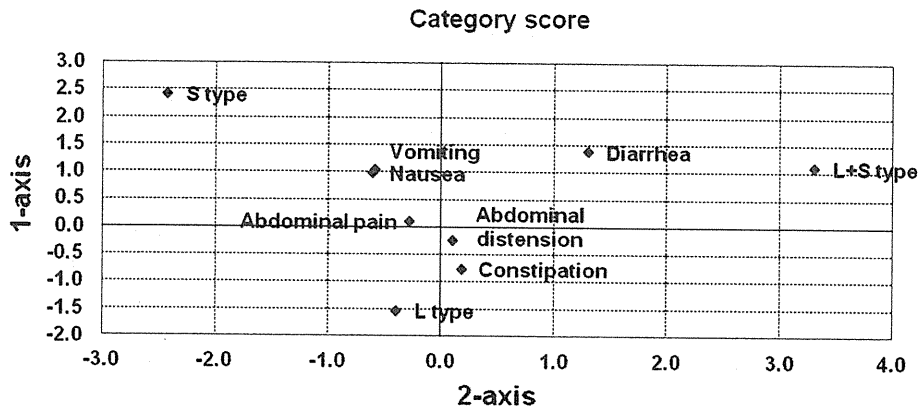

Fig. 3 Symptoms at consultation and the types of the diseased bowel L-type, the large bowel type; S-type, the small bowel type; L + S-type, the large and small bowel type

Table 3 Details of treatments

	Before consultation	After consultation
Diet therapy		
Yes	22 (21%)	35 (34%)
No	56 (54%)	55 (53%)
Unknown	25 (24%)	13 (13%)
Medication therapy		
Yes	64 (62%)	82 (80%)
No	17 (17%)	14 (14%)
Unknown	21 (21%)	6 (6%)
Psychotherapy		
Yes	4 (4%)	5 (5%)
No	80 (79%)	94 (93%)
Unknown	17 (17%)	2 (2%)
Surgical therapy		
Yes	22 (21%)	67 (65%)
No	76 (74%)	35 (34%)
Unknown	5 (5%)	1 (1%)

Table 4 Surgical procedures after consultation

Total colectomy	23
Sigmoidectomy	8
Hartmann	3
Left colectomy	8
Ileocecal resection	2
Fecal diversion only	9
Partial resection of the small bowel	3
Massive resection of the small bowel	3
Sphincterotomy	3
Adhesiolysis	2
Probe laparotomy	1
Total	65

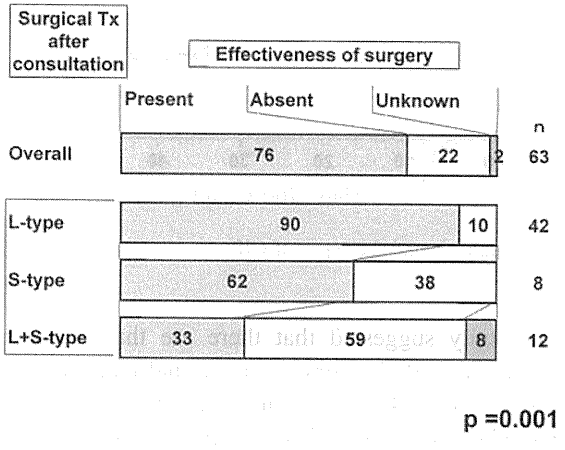

Fig. 4 Effectiveness of surgical treatment and the types of the diseased bowel L-type, the large bowel type; S-type, the small bowel type; L + S-type, the large and small bowel type

intestinal pseudo-obstruction (CIIP). Twenty-one of these cases underwent surgical procedures either before or after consultation. Table 5 shows the associations between the surgical procedures performed and their effectiveness for symptomatic relief. Gastrostomy or enterostomy effectively relieved symptoms, while resection (partial or massive) or colostomy was not effective.

Pathological abnormalities

Figure 5 shows pathological abnormalities with reference to the types of diseased bowels in primary CIP. The frequency of neurogenic abnormalities was less in the small bowel type than in the other types, but there were no statistically significant differences. Myogenic abnormalities were rarely seen in the large bowel type, but there were no statistically significant differences among the types of CIP.

Prognosis

With a mean elapsed time after disease onset until last follow-up or death at 47 years in the primary type and 15 years in the secondary type, the prognosis of the primary CIP was significantly better than that in the secondary CIP (Fig. 6). The causes of death were postoperative complications, chronic heart failure, and liver failure in one case each, and pneumonia in 2 cases in the primary CIP, while amyloidosis in 2, non-SSc collagen disease and sepsis in one case each in the secondary CIP.

Discussion

Chronic idiopathic intestinal pseudo-obstruction is a rare, but a disabling disorder, and the clinicopathological characteristics and optimal management are poorly understood. Adult CIP patients typically pass unrecognized for long periods of time before a correct diagnosis is obtained [1]. This was the first nationwide survey on adult CIP. Although JSCP qualified colorectal surgeons noticed the profile of CIP, the number of CIP cases collected was still limited. The precise incidence or prevalence of CIP in the Japanese population was not elucidated because this was a questionnaire study. Further epidemiological study will be needed to clarify these details.

The diseased bowel segments were not clearly specified in most of the previous publications on CIP [1, 3–5]. A few other reports included the presence of dilated small bowel in the inclusion criteria of CIP [2, 6]. Therefore, no consensus has been reached on this issue. This study did not specify the segments of dilated bowel, and 60 cases of the large bowel type CIP were collected. There might be some arguments that the large bowel type should be diagnosed as

Table 5 Surgical procedures and effectiveness in probable CIIP cases

Procedures	Before consultation	After consultation	Effectiveness		
			Yes	No	Unknown
Gastrostomy + Appendicostomy		1	1		
Enterostomy		2	1	1	
Enterostomy + Cecostomy		1	1		
Colostomy		1		1	
Partial resection					
Small bowel		2	2		
Small and large bowel		2		2	
Large bowel	3			2	1
Unknown	1			1	
Massive resection					
Small bowel	1			1	
Small and large bowel		1		1	
Large bowel	1	5		6	
Bypass	1			1	
Probe laparotomy	1			1	
Internal sphincterotomy		1	1		
Unknown	2			2	

CIIP Chronic idiopathic intestinal pseudo-obstruction

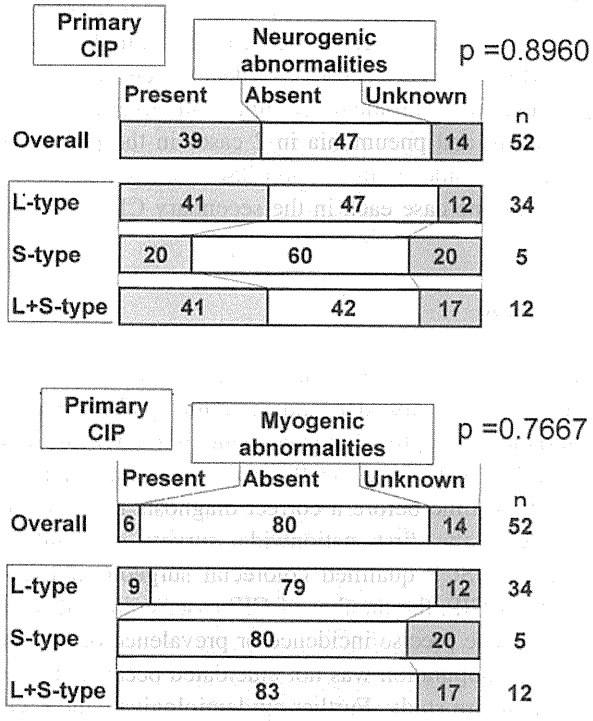

Fig. 5 Pathological findings and the types of the diseased bowel L-type, the large bowel type; S-type, the small bowel type; L + S-type, the large and small bowel type

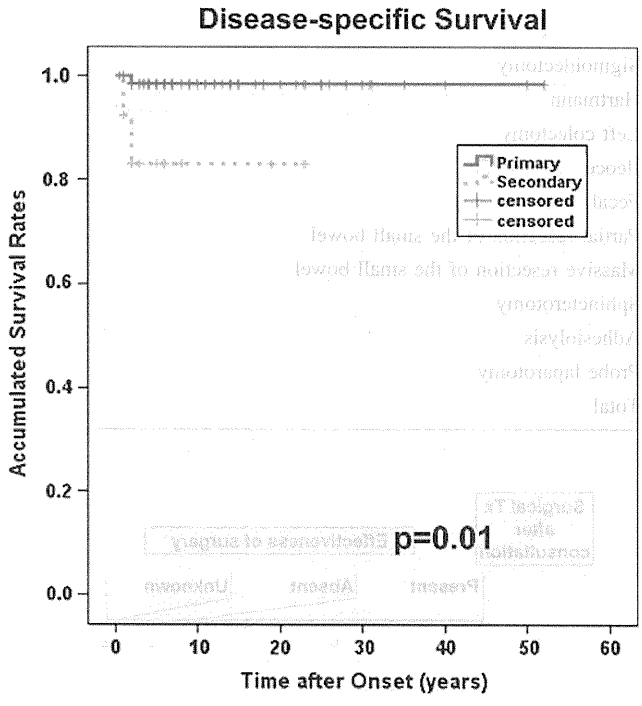

Fig. 6 Prognosis and the types of CIP

idiopathic megacolon or chronic constipation with colonic dilatation; however, the diagnostic criteria of these entities per se have not been determined yet [7, 8]. More comprehensive discussion will be needed to clarify this issue.

This study suggested that there are three clusters of symptoms in CIP. The first is abdominal pain, distension, and constipation. Constipation is closely associated with the large bowel type CIP. The second cluster is nausea and vomiting, which may be associated with the small bowel type CIP. This association has been reported [1]. The third

symptom is diarrhea, which may be associated with the large and small bowel type CIP (extensive type CIP). Diarrhea is often secondary to small bowel bacterial overgrowth, and can be corrected by antibiotics [1, 2].

The histopathological features of CIP are categorized into neuropathic, mesenchymopathic, and myopathic forms based on abnormalities of the enteric nervous system, interstitial cells of Cajal (ICC), and smooth muscle cells, respectively. These abnormalities may cause gut dysmotility either individually or in combination [3]. The distribution of each histopathological abnormality in CIP patients has not been clarified yet. The overall frequencies of neurogenic and myogenic abnormalities were 39 and 6% in the primary CIP; however, no mesenchymopathic abnormalities were described. The association of ICC and gut dysmotility disorders is quite a new concept [9, 10], thus this histopathological feature was not described in the previous cases. A new immunohistochemical study is now in progress in Japan to further investigate this concept.

Surgical treatment for CIP is controversial [4, 11, 12]. Surgical treatment was performed in about two-thirds of patients after consultation in the current series. Although this figure is comparable to those reported previously [5, 13], there may be a selection bias because the current questionnaire study was conducted among colorectal surgeons. Notwithstanding, this study clearly showed that surgical treatment was most effective in the large bowel type CIP, less effective in the small bowel type CIP, and least effective in the large and small bowel type CIP. Furthermore, as shown in Table 5, resection or colostomy was not effective, but gastrostomy or enterostomy was effective in probable CIIP cases. Gastrostomies and enterostomies can effectively decrease vomiting and abdominal distension due to decompression of dilated bowel loops. Enterostomies can also be useful for infusion feeding. Bypass operations or resections may be beneficial in rare cases with localized involvement of the gastrointestinal tract. However, those cases often turn out to be a progressively diffuse disease after surgery. Therefore, the benefit of surgical intervention is transient in most cases [1]. The segment of diseased bowel should be taken into account in determining the indications for surgical treatment in CIP patients.

The prognosis was significantly better in the primary CIP than in the secondary CIP. Operation-related mortality was seen in only one patient with the primary small and large bowel type. Therefore, surgical procedures can be performed safely in CIP patients if the surgical indication is critically determined. Transplantation is attempted in Western countries in CIP children when all other therapeutic interventions have failed [1, 2, 14–16]. The 1-year-patient survival rates were greater than 80% after isolated small bowel transplantation. However, the results were not satisfactory after multivisceral transplantation. Patients who are stable on total parenteral nutrition (TPN) are best managed without transplantation because the survival rates are similar to those of post-transplantation [5]. None of the adult CIP patients underwent transplantation in the current series, and TPN was the treatment of choice in patients not responding to other therapeutic options.

In conclusions, the correct diagnosis of the diseased bowel segments is mandatory for accurate determination of the indications for surgical treatment of CIP patients.

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Conflict of interest All of the authors have no conflict of interest

Appendix

The following surgeons contributed to patient enrollment in this study: Tomoo Shatari, MD (Japanese Red Cross Mito Hospital); Nobumichi Takeuchi, MD (Ina Central Hospital); Kazuhiro Sakamoto, MD (Juntendo University); Masato Kusunoki, MD (Mie University); Kazutaka Narii, MD (Saiseikai Yokohamashi Nanbu Hospital); Tetsuro Higuchi, MD (Tokyo Medical and Dental University); Kazuhiko Yoshimatsu, MD (Tokyo Women's Medical University Medical Center East); Norio Saito, MD (National Cancer Center East); Tomohisa Furuhata MD (Sapporo Medical University); Takanobu Sugase, MD (Koga General Hospital); Kenji Nakagawa, MD (Nakagawa Geka-Ichoka Hospital); Kazuo Hase, MD (National Defense Medical College); Masafumi Inomata, MD (Oita University); Shodo Sakai, MD (Nozaki Tokushukai Hospital); Takayuki Ogino, MD and Hirofumi Ota, MD (Osaka Saiseikai Senri Hospital); Yoshihisa Shibata, MD (Toyohashi Municipal Hospital); Shintaro Akamoto, MD (Kagawa University); Toshimitsu Toyohara, MD (Fukunishikai Hospital); Kazuhiko Yoshioka, MD (Kansai Medical University); Junichi Tanaka, MD (Showa University Northern Yokohama Hospital); Hideo Watanabe, MD (Watanabe Hospital); Tsuneo Iiai, MD (Niigata University); Isao Hirayama, MD (Saiseikai Maebashi Hospital); Masaru Udagawa, MD (Toride Kyodo General Hospital); Tetsuya Kobayashi, MD (Jikei University School of Medicine); Kimiharu Mikami, MD (Fukuoka University Chikushi Hospital); Hiroshi Iino, MD (Yamanashi University); Nagahide Matsubara, MD (Hyogo College of Medicine); Yoshio Ushirokouji, MD (Tokyo Kyosai Hospital); Kazuhiro Toyoda, MD (Higashihiroshima Medical