ORIGINAL RESEARCH

62 Cases of Incomplete Pancreatic Divisum (IPD)– the Usefulness of MRCP Diagnosis and Safety of Endoscopic Treatments-Special Emphasis on our New Endoscopic Procedures-Rendezvous Pre-Cut Method and Reverse Balloon Dilation Method

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ABSTRACT

We have experienced 62 cases of incomplete pancreatic divisum (IPD) over the past 9 years. This is 4.1% (62/1524) of naïve ERP cases during this period. Many classifications were reported in the literature. We classified them by modified "Hirooka's classification" into stenotic fusion type1,2 (sf1, sf2), ansa pancreatica type and branch fusion type1,2,3 (bf1,2,3). 16 cases could be diagnosed by MRCP alone. 47 symptomatic cases were treated by ESWL and/or endoscopy, while 14 asymptomatic cases had no therapy, and 1 asymptomatic case was operated without medical treatment-tail pseudocyst resection. 80%(37/46) of symptomatic patients had a history of alcohol intake, while 69% (11/16) of asymptomatic case had no alcohol intake history.

Endoscopic treatments via major papilla were performed in 15 cases with a success rate of 100%, while treatments via minor papilla were performed in 31 cases with a success rate of 90% (28/31) without severe complications. In 4 difficult cases, we performed our new endoscopic procedures; rendezvous precut method and reverse balloon dilation method. In 43 calcified cases, ESWL and/or endoscopy were performed repeatedly more than 19 non-calcified cases by stone relapse.

After endoscopic treatments, the prognosis was good in 43, poor in 2 and 1 had an operation by pain relapse. EPS is now placed in 36 cases (major13 , minor23) to prevent pain relapse and papilla occlusion.

Preface: In the literature, papers about the diagnosis and the treatment of IPD are few, so we would like to report about MRCP diagnosis and endoscopic treatment of IPD in our hospital over the past 9 years.

AIMS AND METHODS

Aims: To clarify the usefulness of MRCP diagnosis and the safety of endoscopic treatment of IPD.

Methods: 62 cases of IPD, experienced over the past 9 years in our hospital, were enrolled. The usefulness of MRCP diagnosis, safety of endoscopic treatment and their prognoses were evaluated retrospectively. About the prognosis, good; without irregular pain relapse, controlled with every 2 years EPS replacement, poor; irregular pain relapse with repeated EPS replacement.

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Keywords Incomplete Pancreatic Divisum,MRCP,Endoscopic Treatment

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RESULTS

They consisted of 40 males and 22 females, aged 13-90 y/o (mean 63). It was 4.1% (62/1524) of naïve ERP cases in this period. The states of disease were 4 ARP (acute relapsing pancreatitis), 45 CH (chronic pancreatitis), and 13 asymptomatic.

We classified them by the modified "Hirooka's classification" **[Figure 1]** into stenotic fusion type 1,2 (sf1,sf2), branch fusion type 1,2,3 (bf1,2,3), and ansa

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pancreatica type, **[Table 1]** Each number was 8,1,16,0,36 and 0 respectively. One case was unclassified.

The 46 symptomatic cases consisted of 36 males and 10 females (alcoholic 80%) **[6].** Severe pancreatitis cases with pseudocysts were all calcified alcoholic male cases. While 16 asymptomatic cases consisted of 6 males and 10 females (non-alcoholic 69%) **[Table 2]**. 46 cases were diagnosed by ERP and MRCP, while 16 cases by MRCP alone.

Treatment procedures consisted of 33 ESWL+ endoscopy (via major papilla 11, via minor papilla 22), 12 endoscopy alone (via major 3, via minor 9), 1 ESWL alone,1 primarily operation (tail pseudocyst) without medical treatment, 1 pancreato-duodenectomy after medical treatment and 14 no therapy. There were no early complications such as bleeding, perforation and severe pancreatitis and no late complications (ie. stent migration and re-stenosis of papilla).

At the first endoscopic treatment, a pancreatic stent (5 or 7Fr. pig tail type) was placed , then 4 and 10 months later it was replaced. Then every 2 years, ERP was performed and if necessary the stent was replaced. A stent is still in place in 36 cases. 42 symptomatic cases became pain free, however another 3 calcified cases required treatments more repeatedly due to stone and pain relapse and 1 case had an operation (pancreato-duodenectomy) after medical treatment. There were no cases of cancer occurrence or death after treatment.

CASE PRESENTATION

A. 30 y/o m bf3: EPST of minor papilla,balloon dilation and EPS **[Figure 2]** B.Rendezvous pre-cut method: 2 cases **[Figure 3]** 56-year old male bf3: The guidewire, inserted through the major papilla, came out into the duodenum via the minor papilla. Along this guidewire, the minor papilla was cut by the needle type papillotome and the catheter was inserted into the minor papilla, then EPS was placed. This is our original procedure, a variant of the

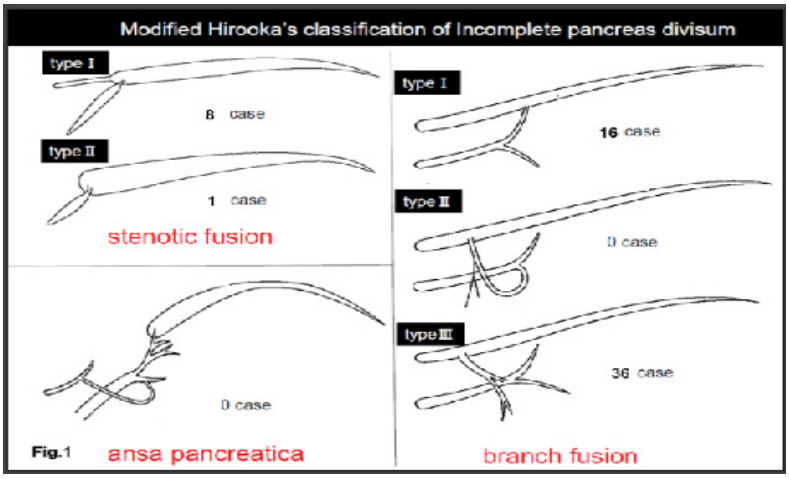

Figure 1. Courtesy of Dr.Hirooka.

Table 1. 62 cases of Incomplete Pancreas Divisum (IPD)
M40 F22 13~90y/o (mean 63) 62/1524 (naïve ERCP)=4.1%
(2014. 4.1.-2023.3.31).

type	stenotic fusion	I 8 II 1	state	ARP	4
	branch fusion	I 16 II 0 III 36		CH	45
	ansa pancreatica type	0		asympto.	13
	unclassified	1			
diag.	ERP and MRCP	46			
	MRCP alone	16			
treat.	ESWL+ endo (via major 11, via minor 22)				33
	endo alone (via major 3, via minor 9)				12
	ESWL alone				1
	primarily ope (tail cyst resection)				1
	ESWL + endo (via major) + ope.				1
	no therapy				14
prognosis of endo therapy 46 cases,					
	goon course				43
	pain relapsing				2
	operation				1
unsuccessful endo therapy 2 cases					

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Table 2. The 46 symptomatic cases consisted of 36 males and 10 females (alcoholic 80%).

pain (+)	**46**	**pain (-)**	**16**
M36	**F10**	**M6**	**F10**
alcho.(+) stone(+)	33		3
alcho.(+) stone(-)	4		2
alcho.(-) stone(+)	6		1
alcho.(-) stone(-)	3		10
Pain (+)		Pain (-)	
37/46=80% alcho.(+)		5/16=31% alcho.(+)	
9/46=20% alcho.(-)		**11/16=69% alcho.(-)**	

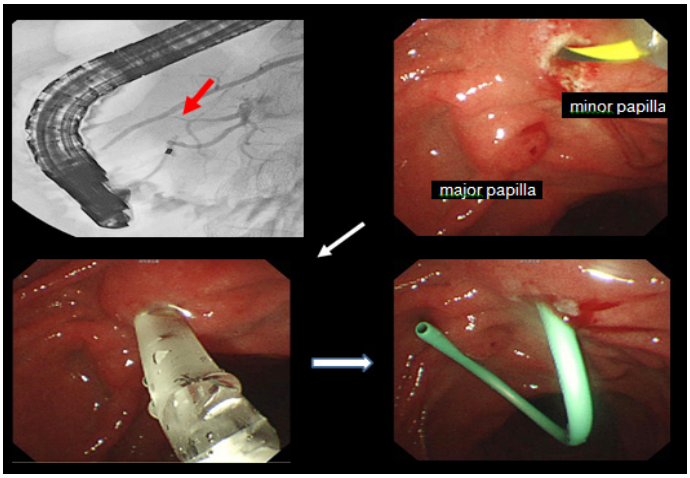

Figure 2. 30 y/o m bf3 EPST of minor papilla,balloon dilation and EPS.

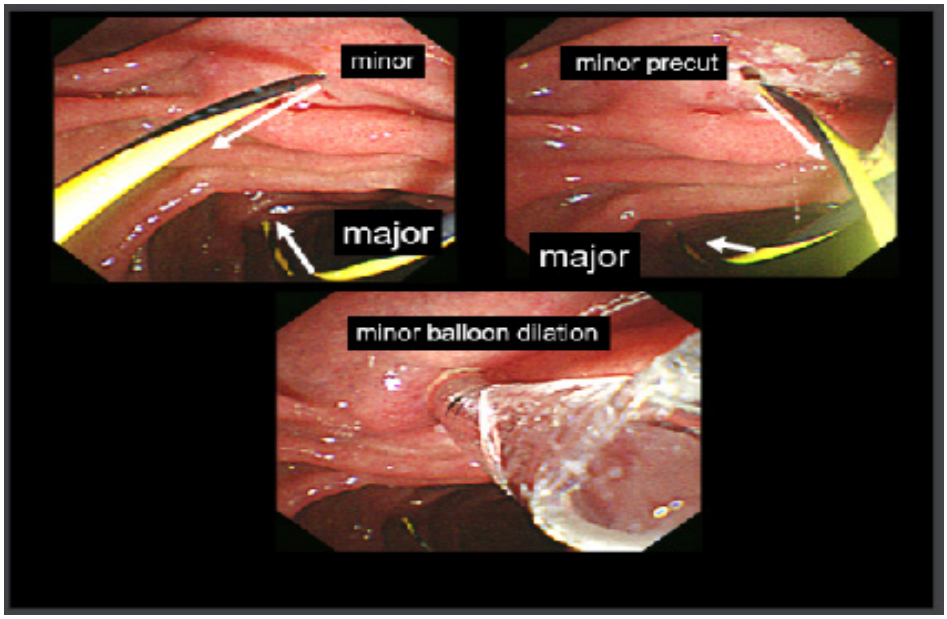

Figure 3. 56y/o m sf1 pancreas stone,rendezvous precut method and EPS.

rendezvous method C. Reverse Balloon Dilation Method: 3 cases **[Figure 4&5]** 13-year old female bf3 : She entered into our hospital complaining of recurrent epigastralgia. The guidewire, inserted into the major papilla, came out via Wirsung's duct, connecting branch, Santorini's duct and minor papilla into the duodenum. The minor papilla was cut by needle type papillotome (rendezvous pre-cut method), then a balloon catheter was inserted along the guidewire and the minor papilla was dilated from the reverse direction by a 4mm dilation balloon, then EPS could be placed into the dorsal duct.

We had 3 cases combined with IPMN- in one case, dorsal duct type IPMN. Minor papilla located in the duodenal diverticulum, was the drainage route of mucin. **[Figure 6&7]** Two young females were treated - one was case presentation 2 above, and the other was a 13 y/o (bf 3) combined with duodenal membranous occlusion

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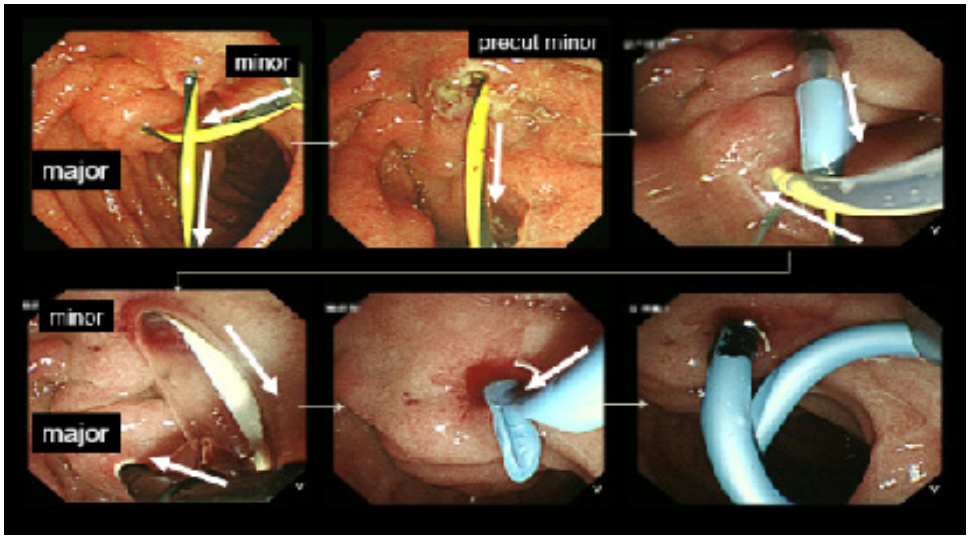

Figure 4. 13y/o f bf3 rendezvous precut method and reverse balloon method..

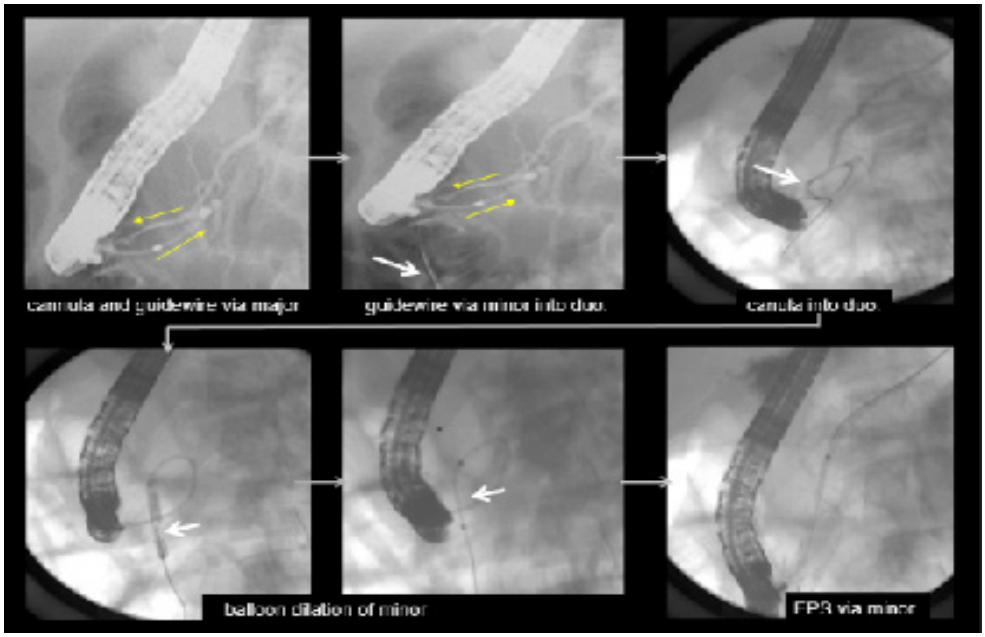

Figure 5. 13y/o f bf3 rendezvous precut method and reverse balloon method.

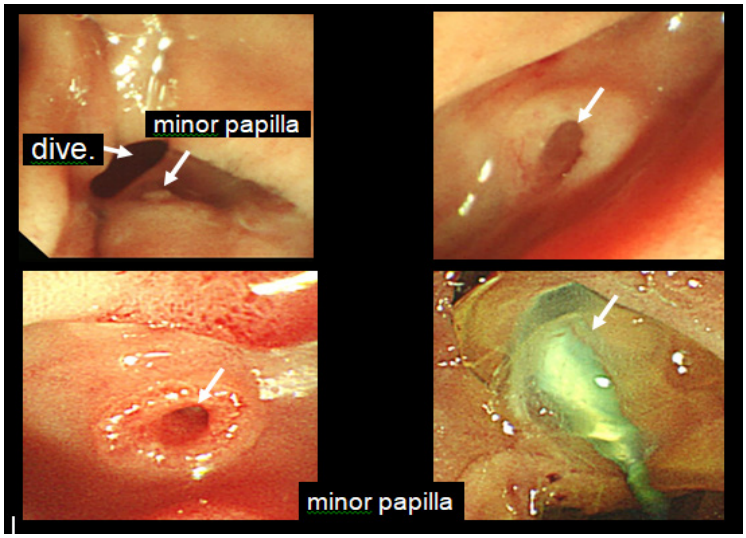

Figure 6. 78y/o f bf3 minor papilla in duodenal dive , IPMN in dorsal duct, EPS.

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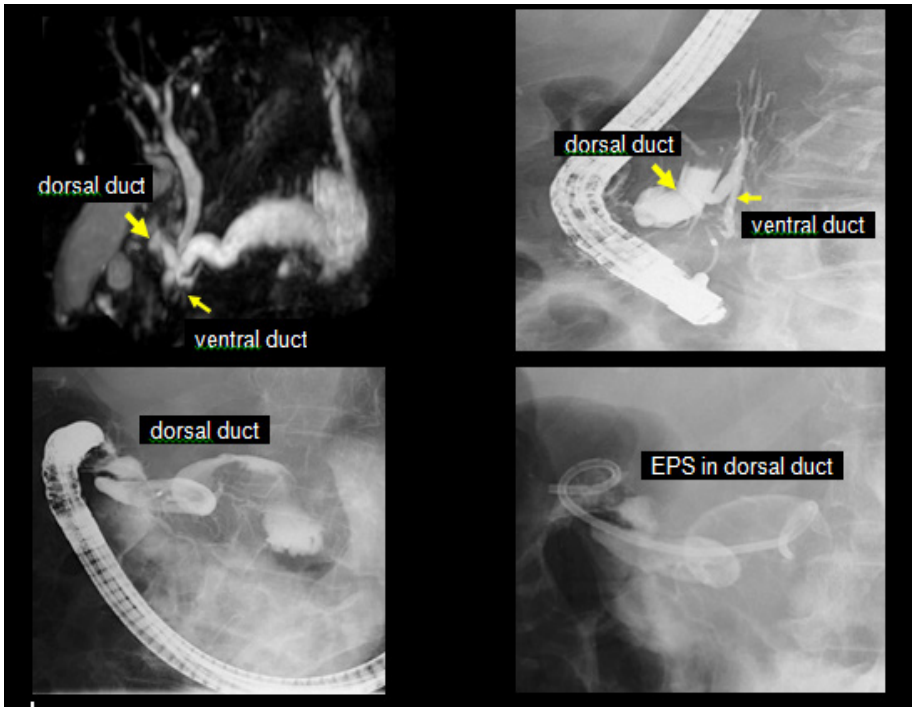

Figure 7. 78y/o f bf3 minor papilla in duodenal dive , IPMN in dorsal duct, EPS.

DISCUSSION

About the prevalence of IPD in the western countries, it is very low with a reported incidence of 0.13—0.9 [1, 2, 3, 4, 5], on the other hands, there was a much higher prevalence data of IPD in the recent reports from Japan and Korea. [6, 7]

We have no data of IPD prevalence in general Japanese population, however, 4.1% (62/1524) of naïve ERP cases were IPD in our hospital over the past 9 years.

In the literature, many types of IPD classification were suggested [8]. In this paper, we proposed a new type one – modified "Hirooka's classification". By this, we classified IPD into sf1, sf2, bf1,2,3, and ansa pancreatica type. But 1 case could not be classified by this classification **[Figure 8]** In the near future, after many reports of IPD, another new useful classification will be proposed. In our reports, no bf 2 type was seen, so we imagine some deviations in our diagnosis.

Recently usefulness of MRCP is reported in diagnosis of IPD [9, 10]. In our series, MRCP was performed in 50 cases-16 cases were diagnosed by MRCP alone, and 44 (89%) cases were diagnosed by MRCP retrospectively. More IPD cases will be reported by MRCP diagnosis in the near future **[Figure 9]**. Like other author's opinion, we think that the congenital dysfunction of the minor papilla and some acquired factors (ie.alcohol intake,obesity) may make IPD symptomatic [11]. In this report, 80% of symptomatic cases had alcoholic intake histories, while 69 % of asymptomatic cases had no such history. About the treatment, medical conservative therapies were recommended in early stages [12, 13, 14, 15] of CPD (complete pancreatic divisum) and IPD. Formally in the symptomatic stage, surgical therapy was performed. In some reports, the therapeutic effects of surgery and endoscopy are almost equal, but in other reports the effect of the former is superior to that of the latter [16]. In many reports, patients of ARP stage had better results than in CH stage after treatment [17].

Recently, endoscopic procedures are the preferred choice for CPD and IPD therapy. Cotton reported minor papilla sphincterotomy in CPD [18], and Jacob reported minor papilla sphincterotomy in CPD [19]. Since then, many new techniques (wire-guided minor papilla sphincterotomy, pre-cut method, needle knife cut method, balloon dilation method) were developed and good results were reported by many authors [20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30]. New therapeutic procedures have been reported by Chavan;reverse sphincterotomy of the minor papilla, and by Artifon;reverse minor papilla balloon dilation without EPS [31, 32]. From 2017, we have introduced and reported about the new therapeutic procedures for the CPD and IPD therapy: pre-cut method, balloon dilation method, free-hand method, rendezvous method, rendezvous pre-cut method and reverse balloon dilation method.

The therapeutic success rate of CPD and IPD via minor papilla was 97% (131/135) and 94% (33/36) respectively without severe complications [33, 34, 35, 36]. However, we had to exchange EPS repeatedly and still now EPS is in place in 36 cases (major13, minor23).We suppose that the metalic stent may be useful in such cases above.

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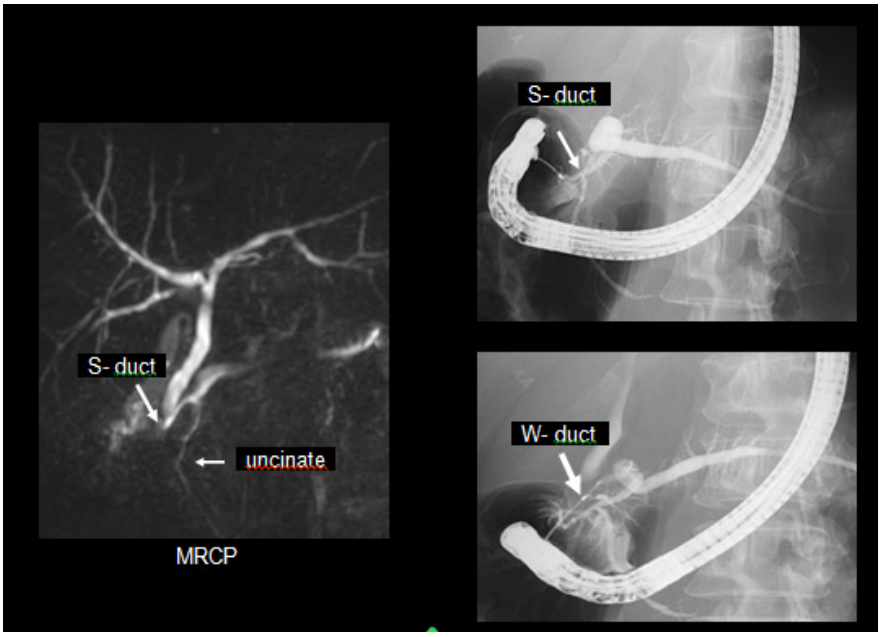

Figure 8. 61y/o f unclassified IPD?

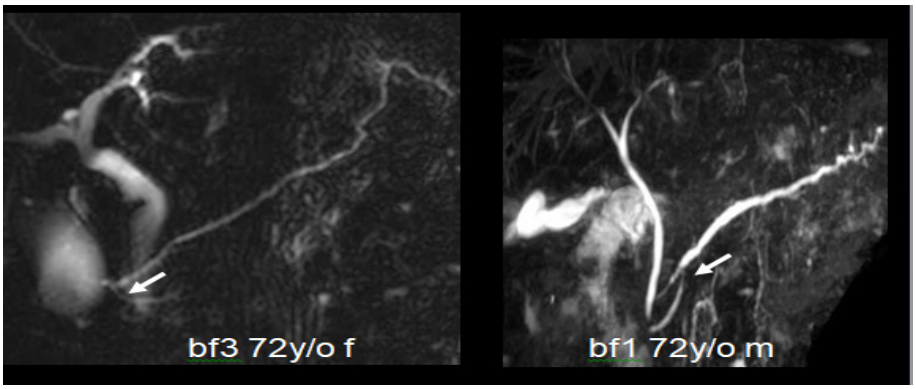

Figure 9. MRCP of bf3 and bf1.

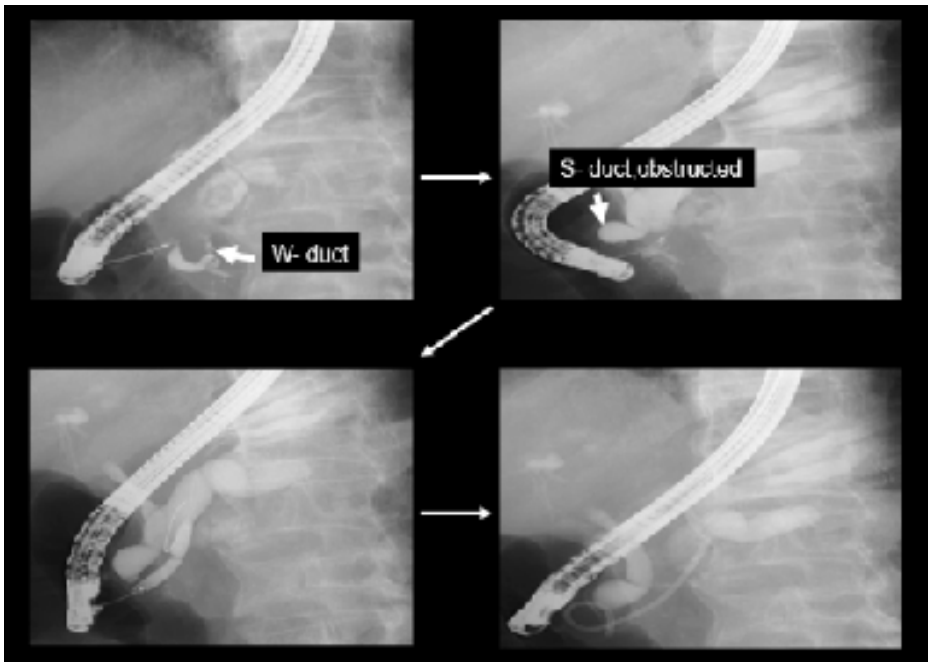

Figure 10. 82 y/o m sf2 IPD balloon dilation of major and EPS.

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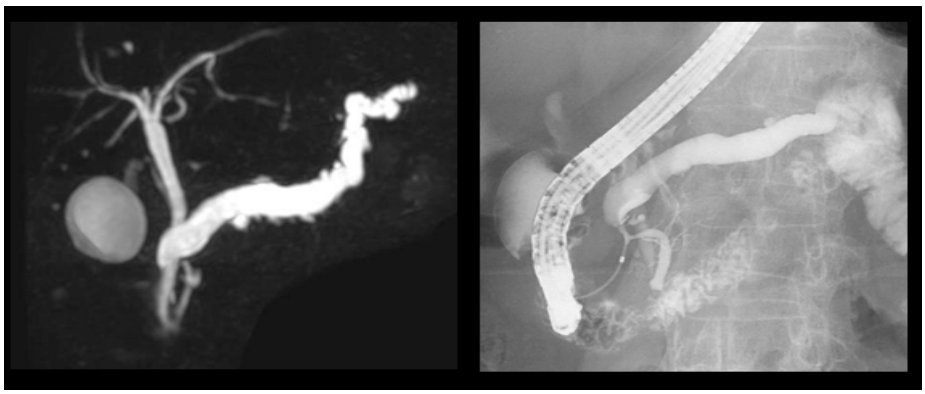

Figure 11. 78 y/o f sf1 IPD asymptomatic.

CONCLUSION

In this paper, we proposed a new classification – modified "Hirooka's classification" and reported the usefulness of MRCP diagnosis and the safety of endoscopic treatments. Our new endoscopic procedures-rendezvous pre-cut method and reverse balloon dilation method are safe and useful for the difficult IPD case treatment. After ESWL and endoscopic treatment of IPD, the prognoses were good. Acquired factors (alcohol intake, obesity) may make IPD symptomatic.

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