

Case Report

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Successful resection of pancreatic head cancer in a patient with circumportal pancreas: a case report with technical consideration

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Abstract: We report a case of pancreaticoduodenectomy for pancreatic head cancer with circumportal pancreas (CP). A 76-year-old woman was referred to our hospital with complaint of generalized pruritus. Dynamic computed tomography (CT) revealed an unenhanced mass at the head of the pancreas and a dilated main pancreatic duct (MPD) behind the superior mesenteric vein (SMV). She was diagnosed with pancreatic head cancer with CP and underwent subtotal stomach-preserving pancreaticoduodenectomy (SSpPD). The pancreas was transected both beneath and above the SMV, and the dominant dorsal edge of the pancreas was mobilized and anastomosed with the gut, whereas the ventral edge was closed by suture and attached to the gut. The postoperative course was uneventful without the occurrence of pancreatic fistula or bleeding. CP is a rare anomaly in which a portal vein (PV) is encircled by the annular pancreatic parenchyma. CP is usually asymptomatic without any significant comorbidity but may become a surgical hazard when pancreaticoduodenectomy is performed. We report our successfully treated case, with special references to the technical approach for pancreatic anastomosis.

Keywords: circumportal pancreas; pancreaticoduodenectomy; pancreaticojejunostomy; postoperative pancreatic fistula; surgical technique.

Case report

A 76-year-old woman with generalized pruritus visited the general practitioner. Her blood test showed elevated liver

enzymes and bilirubin levels, and an abdominal ultrasound test revealed dilation of the intrahepatic bile ducts. She was referred to our hospital for further examination.

Dynamic computed tomography (CT) revealed an unenhanced mass at the head of the pancreas accompanied by dilation of the main pancreatic duct (MPD) and common bile duct (CBD), and most importantly, it revealed that the portal vein (PV) was surrounded by the pancreas. The dilated MPD was located behind the PV (Figure 1). Cytological and histological examinations were attempted by endoscopic retrograde cholangiopancreatography, and the cytology of the pancreatic juice was assessed as Class IV. Preoperative endoscopic retrograde biliary drainage was carried out.

A preoperative diagnosis was pancreatic head cancer with circumportal pancreas (CP). The patient underwent subtotal stomach-preserving pancreaticoduodenectomy (SSpPD). After transecting the pancreas above the superior mesenteric vein (SMV)/PV, we saw the dorsal part of the pancreas, which was the uncinated process communicating with the body of the pancreas behind the PV. After cutting the dorsal part of the pancreas, we saw two cutting planes of the pancreas located both above and below the PV (Figure 2A). We found a dilated MPD in the dorsal side of the cutting plane, but suturing the MPD and pancreas parenchyma with the gut in a deep operating field required great effort, so we mobilized the dorsal part of the pancreas from the PV and pulled through it above the PV to anastomose the MPD and pancreas parenchyma with the gut more easily (Figure 2B). The dorsal cutting plane was anastomosed with the jejunum in the way of modified Blumgart with a lost stent tube. No pancreatic duct was apparent at the ventral cutting plane, so we closed the plane with 3-0 Prolene continuous suturing and attached the ventral stump with the jejunum to prevent postoperative pancreatic fistula (POPF) (Figure 2C).

Histological examination revealed the moderately differentiated adenocarcinoma with lymph node metastasis (Figure 3). Although it took time to reach satisfactory oral feeding because of protracted nausea, the postoperative course was otherwise uneventful without

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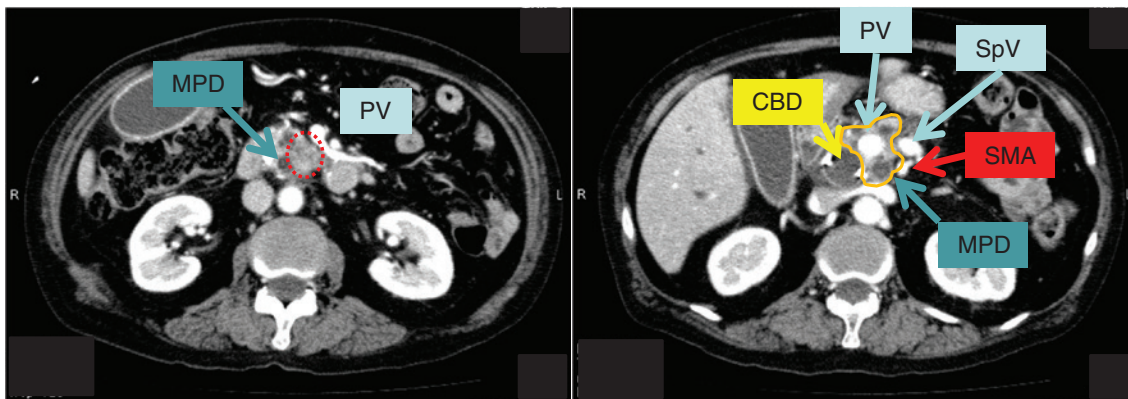


Figure 1: CT scan showed an unenhanced mass at the head of the pancreas (dotted circle) and dilated MPD and CBD, and it also showed that the PV was surrounded by two parts of the pancreas: the dorsal part and the ventral part. MPD was located in the dorsal part of the pancreas. SMA, superior mesenteric artery; SpV, splenic vein.

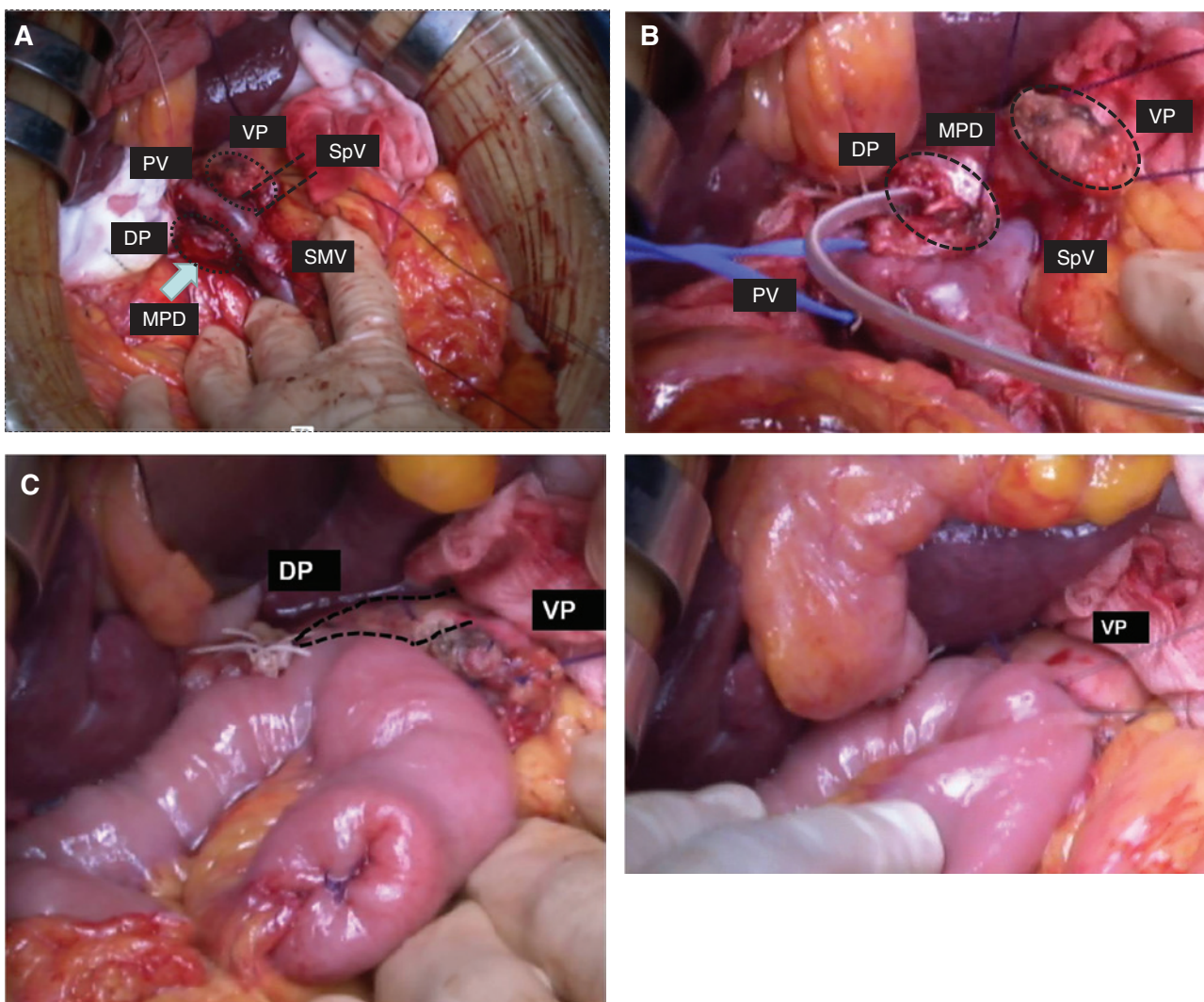


Figure 2: The operative findings.

(A) After removing the head of the pancreas, we saw two cutting planes of the pancreas: the ventral part (VP) above the PV and the dorsal part (DP) behind the PV. The dilated MPD was located in the DP. (B) The DP was mobilized from the PV and then was located above the PV. A pancreatic tube was inserted in the MPD. (C) The DP was anastomosed with the jejunum in the way of modified Blumgart with a lost stent tube. The cutting plane of the VP was sutured and then attached to the jejunum to prevent POPF.

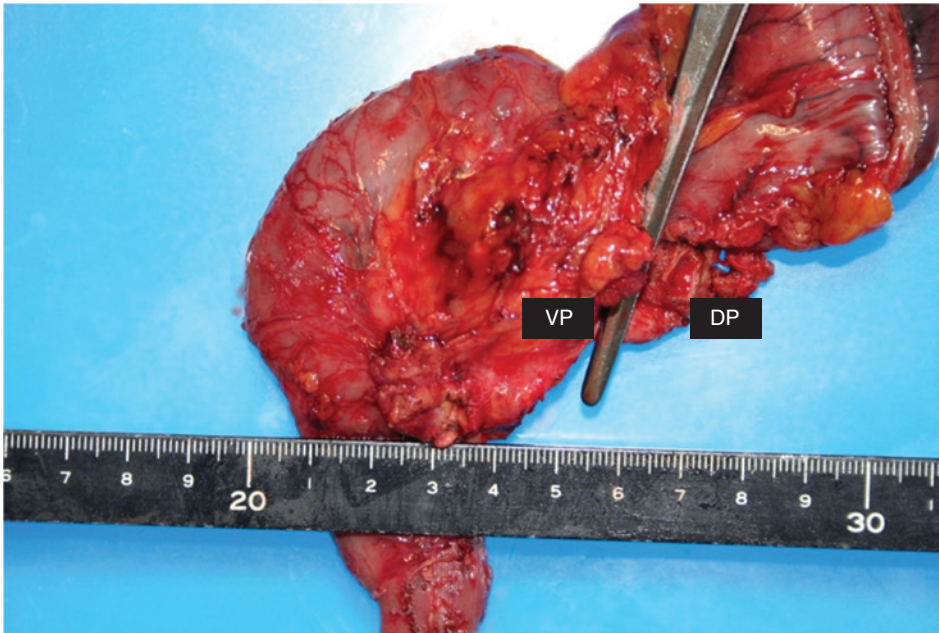


Figure 3: Resected specimen.

The forceps indicates the location of the PV and shows that the PV is encased between the VP and the DP of the pancreas.

any severe complications, such as POPF or postpancreatectomy hemorrhage, and she was discharged on postoperative day 36.

Discussion

CP is a rare pancreatic anomaly with a prevalence of 1.1% [1] to 2.5% [2]. CP itself is usually asymptomatic, so it is usually found only after performing abdominal CT. The pathogenesis of CP remains unknown, but the malformation of the pancreatic primordia or PV has been suggested [3].

CP was classified by Karasaki et al. [1] and otherwise by Joseph et al. [3]. Karasaki et al. classified the anomaly into (A) suprasplenic, (B) infrasplenic, and (C) mixed types based on the relationship between the splenic vein and the retroportal pancreas. Joseph et al. classified it into type 1 [retroportal MPD (RMPD)], type 2 [RMPD with pancreas divisum], and type 3 [anteportal MPD (AMPD)] based on the location of the MPD. Our case is a “suprasplenic” type in accordance with Karasaki’s classification and an “RMPD” type in accordance with Joseph’s classification. The prevalence of this type of CP is about 30% according to the report by Harnoss et al. [4].

CP casts problems when the surgical procedure for the pancreas is planned. When we cut the pancreas at the right side of the SMV, we encounter both the ventral

pancreas and the dorsal pancreas. Therefore, anastomosing the pancreas with the gut may be challenging and the frequency of POPF may increase (it has been reported to be as high as about 40% [4]). To minimize the risk of POPF, several technical modifications have been suggested. One technical method is cutting the pancreas at the left side of the fusion part. In this way, we can get only one cutting plane of the pancreas that should be anastomosed with the gut [5]. However, this procedure has a disadvantage in that additional dissection and resection are necessary, and as a result, it might cause secondary damages to the pancreas or other tissues. It also has another disadvantage in that the resection of larger volumes of the pancreas might cause deterioration of the remnant pancreatic function. Considering these disadvantages, we did not choose this method.

Another technical approach is suturing or ligating the cutting plane without MPD (referred as a nondominant cutting plane) [6, 7]. Ohtsuka et al. [6] reported the method of suturing a nondominant cutting plane by a linear stapler. That case developed POPF unfortunately, but it was unclear whether the cause of POPF lay in the pancreaticojejunostomy or in the sutured site. Our case is similar to Ohtsuka’s report, except that suturing the nondominant cutting plane was performed by a hand-sewn technique and that the stump was attached to the jejunum, resulting in the successful surgical outcome without POPF or postpancreatectomy hemorrhage.

Table 1: Previously reported cases of pancreaticoduodenectomy for CP.

	Report [reference no.]	Karasaki's classification	Joseph's classification	Cutting line method	POPF
1	Sugiura, 1987	B	3	PV, suturing	(-)
2	Hamanaka, 1996	C	3	PV, (n.m.)	(n.m.)
3	Mizuma, 2001 [8]	(n.m.)	(n.m.)	PV, anast	(+)
4	Majanovic, 2007	A	3	PV, stapler	(+)
5	Karasaki, 2009 [1]	B	3	PV, (n.m.)	(+)
6	Joseph, 2010 [3]	(n.m.)	2	PV, ligation	(-)
7	Izuishi, 2010	B	(n.m.)	Left	(-)
8	Ishigami, 2011 [2]	(n.m.)	(n.m.)	Left	(-)
9	Ishigami, 2011 [2]	(n.m.)	(n.m.)	Left	(-)
10	Ishigami, 2011 [2]	A	3	Left	(-)
11	Muto, 2012	(n.m.)	2	Left	(-)
12	Jang, 2012	A	3	PV, stapler	(+) Gr.B
13	Matsumoto, 2013 [5]	B	2	Left	(-)
14	Kobayashi, 2013	A	3	Left	(-)
15	Pardiwala, 2016 [7]	A	3	PV, ligation	(-)
16	Narita, 2016 [9]	A	2	PV, anast (PG)	(-)
17	Ohtsuka, 2016 [6]	A	3	PV, stapler	(-)
18	Ohtsuka, 2016 [6]	A	3	Left	(+) Gr.B
19	Ohtsuka, 2016 [6]	A	3	Left	(-)
20	Ohtsuka, 2016 [6]	A	3	PV, stapler	(-)
21	Ohtsuka, 2016 [6]	A	3	PV, stapler	(+) Gr.B
22	Ohtsuka, 2016 [6]	A	3	Left	(+) Gr.B
23	Ohtsuka, 2016 [6]	A	3	Left	(-)
24	Luu, 2017 [10]	(n.m.)	(n.m.)	Left	(-)
25	Luu, 2017 [10]	(n.m.)	(n.m.)	Left	(-)
26	Luu, 2017 [10]	(n.m.)	(n.m.)	Left	(-)
27	Luu, 2017 [10]	(n.m.)	(n.m.)	Left	(-)
28	Luu, 2017 [10]	(n.m.)	(n.m.)	Left	(-)
29	Luu, 2017 [10]	(n.m.)	(n.m.)	Left	(-)
	Our case, 2017	A	1	PV, suturing	(-)

In column 3, “A” indicates suprasplenic type, “B” indicates infrasplenic type, and “C” indicates mixed type. In column 4, “1” indicates RMPD, “2” indicates RMPD with pancreas divisum, and “3” indicates AMPD. In column 5, “PV” means that the pancreas was transected above and below the PV and “Left” means that the pancreas was transected at the left side of the fusion part. Also in column 5, “suturing” means that the nondominant cutting plane of the pancreas was sutured and “stapler” means that the nondominant pancreas was transected by a stapler. There was one case in which both cutting planes were anastomosed with the jejunum (referred as “anast”) and another case in which both cutting planes were anastomosed with the stomach (referred as “anast (PG)”). Gr.B, grade B POPF; (n.m.), not mentioned; PG, pancreaticogastrostomy.

As far as we have investigated, we found 29 cases of pancreaticoduodenectomy for CP (Table 1). POPF occurred in seven cases; in five cases, the pancreas was transected above and below the SMV/PV, and in two cases, the pancreas was transected at the left side of the fusion part. Suturing or ligating the nondominant cutting plane was performed in three cases, and none of them developed POPF. Transecting the nondominant cutting plane by staplers was performed in five cases, and three of them developed POPF. Suturing or ligating the nondominant cutting plane may have an advantage in that we can check directly any pancreatic ducts that should be anastomosed or closed. However, the surgical method should be chosen depending on the type of anomaly.

In conclusion, CP is a rare, asymptomatic anomaly that matters in pancreaticoduodenectomy because of the higher risk of POPF. The first key to prevent POPF is that surgeons should keep this anomaly in mind and perform a careful preoperative image assessment. Although the best management remains unknown and more cases need to be investigated, the method of suturing a nondominant cutting plane and attaching it to the jejunum, as shown in the current case, may be reasonable.

Author Statement

Research funding: Authors state no funding involved. Conflict of interest: Authors state no conflict of interest. Informed consent: Written informed consent was obtained

from the patient for publication of this case report. Ethical approval: Ethical approval was not applicable.

Author Contributions

Hiroshi Kawamoto: Design of the study; Data retrieval; Writing of the manuscript; Analysis of literature. Takahisa Fujikawa: Design of the study; Revision of the manuscript. Akira Tanaka: Approval of the manuscript.

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Supplemental Material: The article (DOI: 10.1515/iss-2017-0003) offers reviewer assessments as supplementary material.

Reviewer Assessment

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Reviewers' Comments to Original Submission

Reviewer 1: Sören T. Mees

Jan 05, 2017

Reviewer Recommendation Term:	Accept with Minor Revision
Overall Reviewer Manuscript Rating:	60
Custom Review Questions	Response
Is the subject area appropriate for you?	5 - High/Yes
Does the title clearly reflect the paper's content?	5 - High/Yes
Does the abstract clearly reflect the paper's content?	4
Do the keywords clearly reflect the paper's content?	5 - High/Yes
Does the introduction present the problem clearly?	4
Are the results/conclusions justified?	4
How comprehensive and up-to-date is the subject matter presented?	4
How adequate is the data presentation?	4
Are units and terminology used correctly?	N/A
Is the number of cases adequate?	N/A
Are the experimental methods/clinical studies adequate?	N/A
Is the length appropriate in relation to the content?	4
Does the reader get new insights from the article?	4
Please rate the practical significance.	2
Please rate the accuracy of methods.	N/A
Please rate the statistical evaluation and quality control.	N/A
Please rate the appropriateness of the figures and tables.	4
Please rate the appropriateness of the references.	3
Please evaluate the writing style and use of language.	3
Please judge the overall scientific quality of the manuscript.	3
Are you willing to review the revision of this manuscript?	Yes

Comments to Authors:

The authors present a case report dealing with a resection of a pancreatic head cancer in a patient with circumportal pancreas. A circumportal pancreas is rare but its handling during surgery is important for HPB surgeons. Therefore, the case report is of interest for a medium-sized readership. Although there are some case reports/ studies listed in pubmed dealing with this topic, the surgical treatment has not been described in detail so far. Thus, I consider this case report as suitable for publication in ISS.

Minor issues:

- The paper should be revised by a native speaker as it contains errors in grammar and syntax e.g. But this procedure --have-- a disadvantage --that-- it needs additional dissection or resection and, as a result, may cause secondary damages, and --also have one that-- the cutting plane at the pancreas body may be larger than that on SMV/PV. Moreover, the deterioration in the remnant pancreas function may be --concerned--.
- Case report, p3, last sentence: Why was the patient discharged on POD36 in an uneventful postoperative course?
- Please consider the citation of the following literature as it may add valuable information for the reader: PMID 27826941 (surgical treatment!) / 25626884 / 25248793

Reviewer 2: Markus K. Diener

Jan 04, 2017

Reviewer Recommendation Term: Accept with Minor Revision
Overall Reviewer Manuscript Rating: 70

Custom Review Questions	Response
Is the subject area appropriate for you?	5 - High/Yes
Does the title clearly reflect the paper's content?	4
Does the abstract clearly reflect the paper's content?	4
Do the keywords clearly reflect the paper's content?	4
Does the introduction present the problem clearly?	4
Are the results/conclusions justified?	4
How comprehensive and up-to-date is the subject matter presented?	3
How adequate is the data presentation?	3
Are units and terminology used correctly?	4
Is the number of cases adequate?	N/A
Are the experimental methods/clinical studies adequate?	N/A
Is the length appropriate in relation to the content?	5 - High/Yes
Does the reader get new insights from the article?	4
Please rate the practical significance.	3
Please rate the accuracy of methods.	N/A
Please rate the statistical evaluation and quality control.	N/A
Please rate the appropriateness of the figures and tables.	4
Please rate the appropriateness of the references.	2
Please evaluate the writing style and use of language.	2
Please judge the overall scientific quality of the manuscript.	3
Are you willing to review the revision of this manuscript?	Yes

Comments to Authors:

The authors present a case of a patient undergoing pancreatoduodenectomy with the intraoperative finding of retroportal pancreas. This case Report is interesting, since rare findings in surgery must be published in such a way. However, please allow me several comments:

1. Grammar and style has to be corrected; suggest to involve a native Speaker
2. It is not clear enough, if the finding of a retroportal pancreas was known preoperatively. The authors say so, but why didn't they dissect the pancreas on a plane left to the portal vein?
3. Since this anatomical variation is rare; the authors should precisely display the available evidence within this topic. I definitely appreciate the technical remarks, but however, the authors should go into the literature and Report complications and fistula rates after the reported technical variations (if available).

Authors' Response to Reviewer Comments

Jan 12, 2017

Thank you for your January 6th letter according to our manuscript entitled, "Successful resection of pancreatic head cancer in a patient with circumportal pancreas: a case report with technical consideration" (Manuscript ID ISS-2017-0003).

I prepared herein our revised manuscript including figures. Our incorporation of the reviewer's suggestion is as follows:

#1

- 1) Regarding the comments of the reviewer concerning linguistic/stylistic problems, I wholly checked the manuscript and modified accordingly.
- 2) According to the reviewer's comment, we added an explanation for the reason of the prolonged hospital stay.
- 3) According to the reviewer's suggestion, we added the citation of the literature.

#2

- 1) Same as #1- 1)
- 2) According to the reviewer's comment, we added an explanation for the reason of not choosing the method of cutting the pancreas on a plane left to the portal vein.
- 3) According to the review's comment, we added an explanation and a table about the relationship between the technical variations and POPF.

I believe the manuscript has been improved satisfactory and hope it will be accepted for publication in Innovative Surgical Sciences.

Sincerely

Reviewers' Comments to Revision

Reviewer 1: Sören T. Mees

Jan 18, 2017

Reviewer Recommendation Term:	Accept
Overall Reviewer Manuscript Rating:	60
Custom Review Questions	Response
Is the subject area appropriate for you?	3
Does the title clearly reflect the paper's content?	4
Does the abstract clearly reflect the paper's content?	4
Do the keywords clearly reflect the paper's content?	4
Does the introduction present the problem clearly?	4
Are the results/conclusions justified?	4
How comprehensive and up-to-date is the subject matter presented?	4
How adequate is the data presentation?	4
Are units and terminology used correctly?	4
Is the number of cases adequate?	N/A
Are the experimental methods/clinical studies adequate?	4
Is the length appropriate in relation to the content?	4
Does the reader get new insights from the article?	3
Please rate the practical significance.	3
Please rate the accuracy of methods.	4
Please rate the statistical evaluation and quality control.	N/A
Please rate the appropriateness of the figures and tables.	4

Please rate the appropriateness of the references.	4
Please evaluate the writing style and use of language.	3
Please judge the overall scientific quality of the manuscript.	3
Are you willing to review the revision of this manuscript?	Yes

Comments to Authors:

-

Reviewer 2: Markus K. Diener

Jan 17, 2017

Reviewer Recommendation Term:	Accept
Overall Reviewer Manuscript Rating:	70

Custom Review Questions

	Response
Is the subject area appropriate for you?	5 - High/Yes
Does the title clearly reflect the paper's content?	5 - High/Yes
Does the abstract clearly reflect the paper's content?	4
Do the keywords clearly reflect the paper's content?	5 - High/Yes
Does the introduction present the problem clearly?	4
Are the results/conclusions justified?	4
How comprehensive and up-to-date is the subject matter presented?	4
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Are units and terminology used correctly?	4
Is the number of cases adequate?	N/A
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Is the length appropriate in relation to the content?	5 - High/Yes
Does the reader get new insights from the article?	4
Please rate the practical significance.	4
Please rate the accuracy of methods.	N/A
Please rate the statistical evaluation and quality control.	N/A
Please rate the appropriateness of the figures and tables.	5 - High/Yes
Please rate the appropriateness of the references.	4
Please evaluate the writing style and use of language.	3
Please judge the overall scientific quality of the manuscript.	3
Are you willing to review the revision of this manuscript?	Yes

Comments to Authors:

The authors responded adequately to the peer Review comments, and therefore the manuscript was improved significantly.