CASE REPORT – OPEN ACCESS

International Journal of Surgery Case Reports 51 (2018) 190–193

Contents lists available at ScienceDirect

International Journal of Surgery Case Reports

journal homepage: www.casereports.com

# Combined therapy using interventional radiology and surgical management for a ruptured pseudoaneurysm of the iliac artery: A case report

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ARTICLE INFO

*Article history:*
Received 21 June 2018
Accepted 24 August 2018
Available online 30 August 2018

*Keywords:*
Pseudoaneurysm
Catheter embolization
Axillofemoral bypass

ABSTRACT

*INTRODUCTION:* An optimal treatment strategy for a ruptured pseudoaneurysm of the iliac artery must necessarily control bleeding and prevent ischemia in the ipsilateral lower extremity.
*PRESENTATION OF CASE:* A 69-year-old man underwent resection of a metastatic lymph node from rectal cancer, which had invaded the sigmoid colon, the left internal iliac artery and vein, and his left ureter. The metastatic lymph node and the organs it invaded were resected together. Owing to postoperative complications, the patient was required to undergo a 2nd and 3rd operation after the initial surgery. During his 3rd surgery, sudden intraoperative bleeding was identified, which was diagnosed as a ruptured pseudoaneurysm of the internal iliac artery. After achieving temporary surgical hemostasis, the lesion was successfully treated using combined therapy comprising catheter embolization and an axillofemoral bypass.
*DISCUSSION:* Even after temporary surgical hemostasis has been achieved, it is perhaps safer to block the arterial flow prophylactically to avoid recurrence of a pseudoaneurysm owing to infection.
*CONCLUSION:* Combined therapy using catheter embolization and surgical revascularization is a minimally invasive and effective treatment option for a ruptured pseudoaneurysm of the iliac artery.


## 1. Introduction

Pseudoaneurysms occur because of damage to the vascular wall secondary to factors such as trauma, tumor, infection, vasculitis, atherosclerosis, or iatrogenic complications [1]. The formation and rupture of a pseudoaneurysm of an iliac artery after pelvic surgery is rare and is usually associated with fatal complications [2]. An optimal treatment strategy must necessarily control the accompanying bleeding and prevent ischemia in the ipsilateral lower extremity. We report a ruptured pseudoaneurysm of the internal iliac artery after pelvic surgery for lymph node metastasis of rectal cancer, which was successfully treated using combined therapy comprising catheter embolization and axillofemoral bypass after achieving temporary surgical hemostasis.

The work has been reported in line with the SCARE criteria [3]. Informed consent was obtained in this study.

## 2. Presentation of case

A 69-year-old man underwent a low anterior resection for an upper rectal cancer that pathologically was classified as Stage II disease (T2N0M0: The 7th Edition of the TNM classification). The lymph node metastasis in the vicinity of the left internal iliac artery was confirmed at 40 months after surgery. Surgical resection for the lymph node metastasis was scheduled after chemotherapy. Preoperative computed tomography (CT) demonstrated that the metastatic lymph node invaded the sigmoid colon, the left internal iliac artery and vein, and the left ureter (Fig. 1). No metastasis to other organs was observed. He underwent a combined resection of the metastatic lymph node and the organs it had invaded. A colostomy was performed at the oral side of the stump of the resected colon, and the anal side of the stump was sutured and closed (Hartmann's operation - the 1 st operation). He developed a high fever and an acute inflammatory response with discharge of dark red viscous anal fluid on postoperative day (POD) 10. Endoscopic examination revealed a necrotic residual rectal stump, necessitating an abdominoperineal resection (the 2nd operation). Thereafter, secondary to surgical site infection (in the midline inci-

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https://doi.org/10.1016/j.ijscr.2018.08.049

**Fig. 1.** Computed tomography image obtained before the 1st operation demonstrates that the metastatic lymph node (white arrow) measuring 25 × 20 mm in size has invaded the sigmoid colon, the left internal iliac artery (black triangle), the left common iliac vein (white triangle), and the left ureter (white arrowhead).

**Fig. 2.** Computed tomography image obtained before the 3rd surgery demonstrates a round soft tissue mass at the stump of the left internal iliac artery (white arrow).

sion and the perineal wound), we were required to re-open his wound. On POD 15, following intestinal fluid leakage from the open wound site, we performed a re-operation for a diagnosis of intestinal perforation (the 3rd operation). The perforation was confirmed to be a peeled-off portion of an adhesion after the previous surgery, and this site was repaired. Sudden bleeding was identified intraoperatively, which was diagnosed as a ruptured stump of the internal iliac artery, and it was observed to be extremely fragile owing to infection. After encircling and clamping both, the left common and

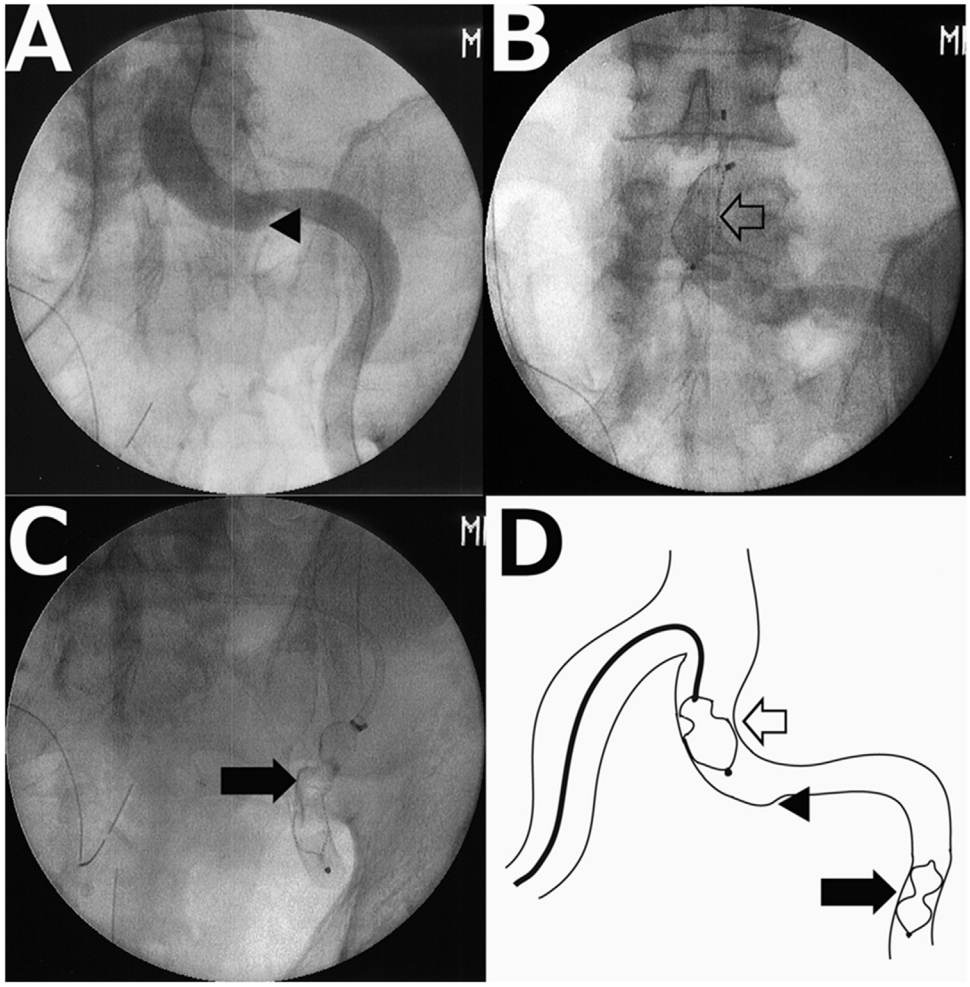


**Fig. 3.** **A**: An intraoperative angiogram shows blood flow from the left common iliac artery to the left femoral artery without any extravasation from the stump of the left internal iliac artery (black triangle). **B**: A proximal plug (white arrow) has been placed in the left common iliac artery. **C**: A distal plug (black arrow) has been placed in the left external iliac artery. **D**: Schematic diagram showing catheter embolization using plugs.

external iliac arteries, the ruptured stump was closed using interrupted non-absorbable monofilament sutures with felt, and a pelvic drain was placed. CT before the 3rd surgery suggested the possibility of a pseudoaneurysm at the stump of the left internal iliac artery (Fig. 2). There existed a high risk of re-rupture of the arterial stump in a setting of continued pelvic infection. We performed combined therapy using interventional radiology and surgical management. On POD 16 (a day after the 3rd surgery), initially we inserted a 6-Fr vascular sheath into the right femoral artery. Adequate blood flow from the left common iliac artery to the femoral artery was confirmed angiographically, and no extravasation was observed from the stump of the left internal iliac artery (Fig. 3A). We performed embolization of the left iliac artery using two 22 mm Amplatzer Vascular Plug II (St. Jude Medical, St. Paul, MN) devices placed proximal and distal to the stump of the left internal iliac artery (Fig. 3B–D). Subsequently, we performed non-anatomical revascularization comprising left axillary artery to left femoral artery bypass using the 8 mm FUSION vascular graft (Maquet Cardiovascular, Wayne, NJ). Postoperative CT demonstrated complete obstruction of the segment between the left common and external iliac artery and good blood flow to the left lower extremity through the bypass (Fig. 4A, B). His general condition gradually improved, and the abdominal drain was removed on POD 38. However, a pelvic abscess was observed to have developed on POD 83 (Fig. 5), which necessitated percutaneous ultrasonographically guided drainage. He showed no recurrence of pseudoaneurysm and was discharged on POD 102.

## 3. Discussion

We encountered a patient who presented with a ruptured pseudoaneurysm of the internal iliac artery. An infected pseudoaneurysm of the aorta or the iliac vessels is a life-threatening condition, particularly if the pseudoaneurysm has already ruptured prior to surgery [2]. The mechanism involving the formation of a pseudoaneurysm following infection remains unknown. Itatani et al. reported that bacteria tend to adhere to the injured arterial intima leading to infectious vasculitis, which precipitates collapse of the arterial wall, and subsequent pseudoaneurysm formation [4]. CT findings that are important to diagnose infected aneurysms are: a lobulated vascular mass, an indistinct irregular arterial wall, perianeurysmal edema, soft tissue mass, and/or gas, aneurysmal thrombosis and/or wall calcification, and disrupted arterial calcification at the site of the infected aneurysm [5,6]. The typical contrast CT findings are leakage of contrast agent from the disrupted arterial wall, identification of a hematoma, and the presence of a contrasted arterial wall. In our patient, contrast CT could not be performed owing to renal dysfunction before the 3rd surgery. The 3rd surgery was performed without a confirmed diagnosis of a pseudoaneurysm, which ruptured intraoperatively and caused major bleeding. The soft tissue mass at the stump of the internal iliac artery which seems to be pseusdoaneurysm was retrospectively confirmed by preoperative CT imaging (Fig. 2).

Standard surgical treatment for infected pseudoaneurysms comprises radical excision and debridement with an anatomical or non-anatomical bypass. However, the procedure could be extremely challenging depending upon the extent of the damage that the infection has inflicted on the arterial wall. Several studies have described combined therapy using catheter embolization and surgical revascularization via a femorofemoral artery bypass for a ruptured pseudoaneurysm of the iliac artery [7–9]. After temporary vascular control has been achieved with occlusion of the common or external iliac arteries, surgical revascularization is required to prevent ischemia in the ipsilateral lower extremity. In the present study, the surgical site infection in the lower abdomen necessi-

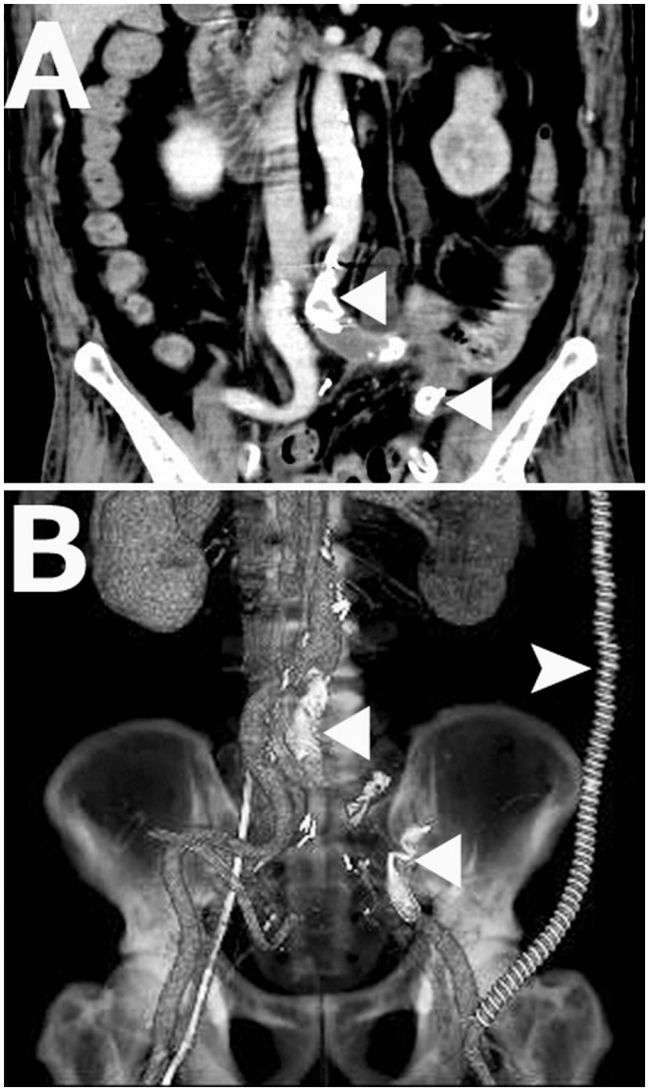


**Fig. 4.** **A**: Computed tomography image after the 4th operation demonstrates disappearance of the blood flow between the left common iliac artery and the external iliac artery following the use of plugs (white triangles), and thrombus formation can be visualized in the vessel between these 2 arteries. **B**: Three-dimensional (3-D) computed tomography image demonstrates good patency of the axillofemoral artery bypass (white arrowhead).

**Fig. 5.** Computed tomography image obtained on postoperative day 83 demonstrates the formation of an abscess (white arrow head) in the vicinity of the left iliac artery, which is occluded by plugs (white triangles).

tated a non-anatomical bypass (axillofemoral artery bypass) owing to the risk of graft infection in a femorofemoral artery bypass. In 3 previously reported cases, combined therapy using catheter embolization and surgical revascularization was performed after the preoperative diagnosis of a ruptured pseudoaneurysm. This case is the first report to describe combined therapy that was performed to prevent re-bleeding after temporary surgical hemostasis in a patient with a ruptured pseudoaneurysm of the iliac artery. Temporary surgical hemostasis for ruptured pseudoaneurysms without blocking the arterial flow may be associated with a high risk of re-bleeding. In our patient, although a pelvic abscess developed in the vicinity of the iliac artery on POD 83, recurrence of a pseudoaneurysm was not observed. We reckon that even after temporary surgical hemostasis has been achieved, it is perhaps safer to block the arterial flow prophylactically to avoid recurrence of a pseudoaneurysm owing to infection.

Endovascular intervention using a covered stent can achieve more rapid control of bleeding than surgical techniques [1]. Stent grafting is minimally invasive, however, the outcome is unproven in a setting of infected pseudoaneurysms. Therefore, we decided to avoid placing a stent graft in the artery in the vicinity of the infected lesion and place the plugs away from the infected lesion. Moulakakis et al. reported a systematic review analysis of the current literature describing the efficacy and outcome of endovascular treatment of infected iliofemoral arterial pseudoaneurysms using covered stents [10]. Their review, with a mean follow-up of 15.8 months demonstrated a low re-infection rate (3.4%) and a high graft-patency rate (90%). Because the long-term outcome is unknown, the risk-benefit ratio ought to be carefully considered prior to using stent grafts for infected pseudoaneurysms.

## 4. Conclusions

Combined therapy using catheter embolization and surgical revascularization is a minimally invasive and effective treatment strategy for ruptured pseudoaneurysms of the iliac artery.

## Conflicts of interest

The authors have no disclosure or conflict of interest related to this manuscript.

## Funding

There were no sponsors participating in this case report.

## Ethical approval

Our institution does not require ethical approval for publishing a case report.

## Consent

Written consent was obtained from the patient for publication of this article.

## Author contribution

All authors participated equally in the presentation of the case report.

Kazuhiko Sakamoto is the main author of this article. Akihiro Tokuhisa, Kenyu Nishimura, Kazuhisa Tokunou, Ryoji Kamei, Yoshinori Kitamura, Seiichiro Ando and Tatsuhito Yamamoto performed clinical treatment including surgery (1st, 2nd and 3rd). Masafumi Sato, Toshiro Kobayashi and Hidenori Gohra performed 4th surgery. Tatsuhito Yamamoto and Hidenori Gohra reviewed the manuscript. All authors have read and approved the final manuscript.

## Registration of research studies

This is a case report and according to the research registry, its registration is not essential.

## Guarantor

Tatsuhito Yamamoto.

## Provenance and peer review

Not commissioned, externally peer-reviewed.

## Acknowledgement

We would like to thank Editage (www.editage.jp) for English language editing.

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