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ORIGINAL ARTICLE

# Management of true visceral artery aneurysms in 31 cases



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## KEYWORDS

Visceral artery aneurysm;  
False aneurysm;  
Coil embolization;  
Indications;  
Chronic pancreatitis

## Summary

**Introduction:** True visceral artery aneurysms (VAA) should be treated under elective conditions in dependency on maximum diameter. In this respect, the traditional accepted threshold is 2 cm, whereas VAA sizing less than 2 cm should conservatively be observed without invasive treatment. The aim of this study was to review differences in the treatment outcome over three decades.

**Material and methods:** This was a retrospective review of all treated VAAs at one institution from 1985 to 2015. Patients demographics, aneurysm characteristics, management and outcome were recorded with special regard to differences in the course of time.

**Results:** Thirty-one true VAA in 29 patients (74% female) were repaired (5 ruptured, 26 intact). Mean diameter was  $30.27 \pm 11$  mm for intact and  $38.0 \pm 8.5$  mm for ruptured VAA (rVAA) ( $P = \text{NS}$ ). Most patients were asymptomatic (67.8% asymptomatic, 16.1% symptomatic without rupture and 16.1% with rupture). There was a vice-versa situation in chosen treatment techniques between the first (1985–2000) and the second (2001–2015) time period [first period: 75% open repair (OR) and 25% endovascular repair (ER); second period: 27% OR and 73% ER;  $P = 0.009$ ]. OR included aneurysm ligation and resection with (end-to-end-anastomosis, graft interposition or without blood flow reconstruction), while ER was exclusively coil embolization with sacrifice of all parent afferent and efferent arteries. Immediate technical success was 81% for all procedures. There was a trend toward higher technical success rate of VAA being treated in second time period, but we found no significant differences (69% in the first, 93% in the second;  $P = 0.101$ ). Conversion to OR due to technical failures was necessary after 3 endovascular repairs (20%). The overall 30-day-mortality rate decreases in the course of time (25% in the first and 0% in the second period;  $P = 0.038$ ). Furthermore, there was a lower 30-day mortality rate after ER of all VAA (elective and urgent repair) (20% after OR, 0% after ER;  $P = 0.038$ ). There was no decrease in 30-day mortality rate of rVAA (100% in the first and 20% in the second period;  $P = \text{NS}$ ).

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*Conclusion:* In the fact of medical progress and a growing number of endovascular procedures, this study presents a decrease in mortality rate after elective aneurysm repair over three decades. This might become an argument to reduce the 2-cm threshold in highly selected individuals.

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## Introduction

Visceral artery aneurysms (VAA) are a rare disease with an estimated incidence about 0.1 to 2.0% [1]. Nowadays advanced imaging techniques as computed tomography or magnetic resonance angiography are widely used and therefore incidental detection of VAA increased over the years [2]. Rupture is the most serious complication of VAA and invasive management primarily should avoid this life-threatening condition. Asymptomatic true VAA outside childbearing age or pregnancy should be treated if maximum diameter is 2 cm or more [3,4]. These traditional recommendations to exclude VAA are mainly dated from a period before endovascular techniques were available and open surgery was the only way to exclude aneurysms [5]. Since the early 20th century endovascular management in different techniques has increasingly been used with promising results especially in multimorbid poor surgical candidates [6]. Furthermore medical progress, especially the management of critical illness as hemorrhagic shock, has evolved over the last decades [7].

The aim of this study was to analyze early and follow-up results after elective treatment of VAA with special regard to differences in the course of time and therefore possible effects on future indications of invasive treatment.

## Material and methods

### Patients

Thirty-one true VAA in 29 patients were repaired in our institution from January 1985 to June 2015 by open or endovascular techniques. To analyze differences in the course of time, patients were divided into two groups: 16 VAA (group 1) were treated from January 1985 to December 2000 and 15 VAA (group 2) from January 2001 to June 2015. Patients under surveillance were excluded as well as false VAA due to their different indications and etiology.

### Indications and treatment techniques

Indications for open repair (OR) or endovascular repair (ER) was a diameter of 2 cm or more, every VAA in women of childbearing age and every symptomatic or ruptured VAA (rVAA) without regard to size. OR was performed by aneurysm resection or ligation with (end-to-end-anastomosis, vein-interposition or bypass grafting) or without (ligation or resection) blood flow reconstruction. All endovascular interventions were performed in an angi-suite by interventional radiologists, under local anaesthesia, supplemented with sedation or analgesia when required. An unilateral femoral approach was preferentially used and all patients underwent intravenous administration of 5000 IU of sodium heparin at the time of arterial catheterization. In detail, coils were packed into the efferent and afterwards

the afferent artery. Furthermore, in cases of persisting blood flow, coils were packed into the aneurysm sac. A sacrifice of all parent afferent and efferent arteries was done. There were no other endovascular techniques employed (i.e. stent placement or embolization using liquid agents) and no use of minimal invasive laparoscopic treatment in this study.

### Definitions

Definitions were as follows: technical success (no further blood flow within the aneurysm sac), conversion to open surgery (technical failure followed by surgical repair), major complications (stroke, myocardial infarction, bleeding leading to surgery or death). Hemodynamic shock was defined as a shock-index > 1 (heart rate divided by systolic blood pressure) when admitting the hospital.

### Diagnostic work-up

In every elective repaired VAA, the preoperative diagnostic tool included duplex ultrasound (DUS), computed tomographic angiography (CTA) or magnetic resonance angiography (MRA), whereas 3 of the 5 patients with ruptured VAA (rVAA) underwent emergency surgery without vascular imaging.

### Follow-up program

Follow-up examinations included DUS two times a year for the first 24-month, afterwards in case of inconspicuous findings in annual intervals. CTA or MRA was carried out in cases where DUS was technically not sufficient (e.g. in the presence of obesity) or in the suspicion of reperfusion due to technical failures.

### Data collection and analysis

Data collection was done in a retrospective manner by analyzing medical records. Statistical analysis was performed by means of SPSS 21.0 for Windows (SPSS Inc., Chicago, Illinois). Differences between groups were analyzed for categorical variables ( $\chi^2$ ) and for numerical ( $t$ -test). The  $\alpha$  level for significant tests was 0.05. A  $P > 0.05$  represents no significant (NS) differences.

## Results

### Patients

Demographic data and comorbid conditions are shown in Table 1. There was no significant difference between the two groups. One asymptomatic female patient in group 1 received OR during pregnancy. Five patients (16%) suffered from hemorrhagic shock due to rupture and emergency

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