Concomitant Intra-abdominal Disease in Aortic Surgery

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Introduction

Concomitant intra-abdominal diseases can significantly influence the prognosis in patients with abdominal aortic aneurysms and have major impact on the planning and technical performance of aneurysm repair. Although the topic has been discussed for decades, questions as to which disease should have priority and the influence on the outcome of treatment are still controversial. One explanation is that each centre will only be able to accumulate limited experience with this specific combination of diseases. One of the most frequent conditions seen in this context is carcinoma of the colon. Malignancies in the urogenital system are included in this survey, as they may represent special problems. Furthermore, cholelithiasis and cholecystitis are seen occasionally. Diverticulitis of the colon and other inflammatory bowel diseases may be observed in rare cases. The purpose of this article is to review a series of patients operated on for infrarenal abdominal aortic aneurysm (AAA) and to analyse the occurrence of concomitant intra-abdominal diseases, including its influence on complication rate and final outcome.

Materials and Methods

During the period January 1 1983 to December 31 1993, 459 patients were operated on consecutively for infrarenal AAA. Twenty-one percent of the patients were referred from other hospitals because of complicating diseases or anticipated technical problems with the operation. In this investigation we have defined concomitant intra-abdominal disease as that detected during diagnostic examination for a known AAA, or detected during an operation performed with the intention to repair the aneurysm. In other cases the aneurysm was detected during surgery for another intra-abdominal disease. During aneurysm repair, inspection and palpation of intra-abdominal organs should be routine. Although this part of the procedure may be less than optimal in patients with ruptured aneurysm, we have decided to calculate the incidence of concomitant disease by including all 459 patients.

The investigation was performed retrospectively. Prior to elective operations, aortography was carried out in all cases, whereas ultrasound examination or CT scan were only performed for special indications. All patients were operated on under general anaesthesia using a midline laparotomy incision. Inspection and palpation of intra-abdominal organs was performed and the findings noted in the operating report.

Regular postoperative complications, although included in the investigation, are not discussed further with the exception of postoperative cholecystitis. Furthermore, it is outside the scope of this article to discuss concomitant vascular diseases such as obstruction of the mesenteric or renal arteries. Some conditions affecting the urogenital system are included because they may represent special problems. No systematic follow-up was performed in this investigation, but most patients have been followed in the outpatient clinic. The mean follow-up period was 2.5 years. In patients with concomitant disease a complete follow-up investigation was performed.

Results

Malignancies

The series included six patients with colorectal cancer (1.3%). All patients, with one exception, had symptoms or signs associated with their bowel disease (Table 1).
Table 1. Concomitant colorectal cancer and abdominal aortic aneurysm.

<table>
<thead>
<tr>
<th>Age (y)</th>
<th>Sex</th>
<th>Symptoms</th>
<th>Aneurysm diameter (cm)</th>
<th>Dukes' stage of the carcinoma</th>
<th>Location of tumour</th>
<th>First operation</th>
<th>Interval from first to second operation (months)</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>72</td>
<td>F</td>
<td>Abdominal pain</td>
<td>4.5</td>
<td>C</td>
<td>Right flexure</td>
<td>Right hemicolectomy, right nephrectomy, duodenal resection</td>
<td>7</td>
<td>Alive after 5 years without recurrence</td>
</tr>
<tr>
<td>65</td>
<td>M</td>
<td>Haemorrhagic diarrhoea</td>
<td>4.5</td>
<td>B</td>
<td>Rectum</td>
<td>Low anterior resection, sigmoidostomy</td>
<td>4</td>
<td>Alive after 6 years, no recurrence</td>
</tr>
<tr>
<td>72</td>
<td>M</td>
<td>Abdominal pain, rectal haemorrhage</td>
<td>6.0</td>
<td>A</td>
<td>Rectum</td>
<td>Abdominoperineal resection, sigmoidostomy</td>
<td>1.5</td>
<td>Died 4.5 years postoperatively from myocardial infarction</td>
</tr>
<tr>
<td>71</td>
<td>M</td>
<td>Pain in the right fossa, diarrhoea</td>
<td>4.5*</td>
<td>B</td>
<td>Ascending colon</td>
<td>Right hemicolectomy</td>
<td>4</td>
<td>Alive after 4 years without recurrence</td>
</tr>
<tr>
<td>58</td>
<td>M</td>
<td>Abdominal pain, weight loss</td>
<td>5.0</td>
<td>C</td>
<td>Sigmoid colon</td>
<td>Resection of the sigmoid colon</td>
<td>2</td>
<td>Died after 1.5 years from metastasis</td>
</tr>
<tr>
<td>81</td>
<td>M</td>
<td>Anaemia, abdominal tumour</td>
<td>7.0†</td>
<td>B</td>
<td>Multiple tumours in the caecum, ascending and transverse colon</td>
<td>5.5</td>
<td>Alive after 10 years without recurrence</td>
<td></td>
</tr>
</tbody>
</table>

* Had additional aneurysm of the common femoral artery with a diameter of 2.5 cm.
† Had large aneurysms of the iliac arteries bilaterally.

Three patients had both conditions diagnosed prior to operation, whereas AAA was detected during an operation for cancer in two, and in one patient a locally advanced cancer (Dukes stage C) in the right colon was discovered during a planned AAA repair. In two patients the carcinoma was located in the rectum, two had involvement of the right colon and one of the sigmoid colon, whereas one had multiple cancers affecting both the right and transverse part of the colon. One of the patients with rectal carcinoma was treated by abdominoperineal resection and sigmoidostomy, whereas a low anterior resection was possible in the other patient. Histologically two tumours were classified as Dukes stage C, three as Dukes B and one as Dukes A. In all patients the carcinoma was given priority and AAA repair was performed as a staged procedure. For both operations a transperitoneal approach was applied. No complications occurred in this group of patients. In one patient the inferior mesenteric artery was patent and therefore reimplanted into the graft. One patient died 1.5 years after the last operation due to metastasis from a Dukes C cancer in the sigmoid colon, and one died 4.5 years later of myocardial infarction. The rest of the patients are alive from 4 to 10 years postoperatively.

Four patients had concomitant renal carcinoma (0.9%). In one patient both conditions were operated during the same procedure, which included a right aortorenal bypass and resection of the left kidney (Table 2). Preoperatively this patient was regarded as a high risk case due to severe coronary heart disease and uraemia, and he died 6 h postoperatively. Two other patients had their renal carcinoma detected during preoperative examinations for AAA. In both cases nephrectomy only was performed during the first operation, and it was the original plan to leave the aneurysm unoperated. However, the aneurysms were operated on 8 and 12 months later, respectively, due to pain and increasing size of the aneurysm. Both patients are alive without symptoms 4 and 8 years after the last operation. In one patient with assumed impending rupture of a known aortic aneurysm, renal carcinoma and lymph node metastasis were detected during the aneurysm repair.

Two patients suffered from carcinoma of the urinary bladder (0.4%). The condition was detected prior to AAA repair and treated by transurethral electrocoagulation. Both patients were later operated on for their aneurysm with intervals of 1 and 6 months, respectively. One patient died 5 years later from haemorrhage caused by a fistula between the right graft limb and the coecum. Primarily this patient was operated on for an inflammatory aneurysm causing uraemia due to obstruction of the ureters. Prior to operation he had a transitional cell cancer in the bladder (stage WHO I) successfully treated with transurethral electrocoagulation. The other patient is still alive 11 years following aneurysm repair.
### Table 2. Concomitant pre- and intraoperative cholecystitis and abdominal aortic aneurysm.

<table>
<thead>
<tr>
<th>Age</th>
<th>Sex</th>
<th>Aneurysm diameter (cm)</th>
<th>First operation</th>
<th>Complication</th>
<th>Second operation</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>83</td>
<td>M</td>
<td>8.0</td>
<td>Cholecystectomy</td>
<td>Suprahepatic abscess percutaneous drainage</td>
<td>Y-graft 2.5 months later</td>
<td>Died 1 year later from myocardial infarction</td>
</tr>
<tr>
<td>67</td>
<td>F</td>
<td>3.5*</td>
<td>Cholecystectomy</td>
<td>None</td>
<td>Aortobifemoral bypass 1 month later (critical limb ischaemia)</td>
<td>Succumbed on the 6th postoperative day from mesenteric artery thrombosis</td>
</tr>
<tr>
<td>74</td>
<td>M</td>
<td>5.0</td>
<td>Cholecystectomy</td>
<td>None</td>
<td>I-graft 1.5 months later</td>
<td>Developed renal insufficiency and died 3 years later from myocardial infarction</td>
</tr>
<tr>
<td>76</td>
<td>M</td>
<td>9.3</td>
<td>Common bile duct stone and cholecystitis. ERCP, 6 days later Y-graft implant and cholecystectomy</td>
<td>None</td>
<td>None</td>
<td>Died 3 years later from unknown cause</td>
</tr>
<tr>
<td>63</td>
<td>F</td>
<td>4.0†</td>
<td>Cholecystectomy</td>
<td>None</td>
<td>Y-graft. Revascularisation left limb</td>
<td>Died on the 6th postoperative day from mesenterial artery thrombosis</td>
</tr>
<tr>
<td>73</td>
<td>F</td>
<td>3.9</td>
<td>I-prosthesis. Iatrogenic damage of AAA during attempted laparoscopic cholecystectomy</td>
<td>None</td>
<td>None</td>
<td>Alive 2.5 years without symptoms</td>
</tr>
<tr>
<td>82</td>
<td>M</td>
<td>5.5†</td>
<td>Y-prosthesis</td>
<td>Diagnosed stone in the common bile duct and fistula between colon and the gall bladder. The aneurysm ruptured while admitted for surgery of the fistula</td>
<td>None</td>
<td>Died from myocardial infarction 1 year later following laparotomy for intestinal obstruction caused by adhesions</td>
</tr>
</tbody>
</table>

*The patient had gangrene and rest pain from aortoiliac obstruction, which was the indication for aortic surgery.
† Critical ischaemia left limb.
‡ Operated on for ruptured aneurysm.

To conclude, a total of 11 patients (2.4%) had concomitant carcinoma of the colon or the urogenital system and in all cases it was decided to treat the aneurysm in a second procedure. No complications were recorded as a result of this policy.

**Cholelithiasis/cholecystitis**

In this series, asymptomatic cholelithiasis was not recorded. Five patients had cholelithiasis prior to a planned operation for AAA. In all cases, with one exception, cholecystectomy was carried out primarily and the aneurysm repair performed as a staged procedure with an interval from 1 to 2.5 months. One patient was treated by a combined procedure. First the aneurysm was repaired, followed by closure of the peritoneum. Thereafter cholecystectomy was carried out. The cholecystitis, which was caused by a common bile duct stone, was resolving following ERCP and papillotomy prior to the operation. One patient with AAA had a stone in the common bile duct and a fistula between the gall bladder and the colon. Surgery for the latter condition was planned, but the aneurysm ruptured and an acute operation became necessary. One year later the patient succumbed from myocardial infarction following an operation for adhesions causing intestinal obstruction. Another patient had a known AAA with a diameter of 3.9 cm without indication for surgery. She also had symptomatic cholelithiasis and was scheduled for laparoscopic cholecystectomy. During the operation a trocar perforated the aneurysmal sac requiring immediate laparotomy, aneurysm resection and implantation of a vascular graft. Her cholelithiasis is still unoperated and the patient is asymptomatic 2.5 years after the operation (Table 3).

In summary, five patients were operated on for both conditions, whereas two patients had aneurysm repair only. The prognosis in patients with cholecystitis seems rather serious because only one patient was alive without having her gall bladder removed. Most of
Table 3. Concomitant renal carcinoma and abdominal aortic aneurysm.

<table>
<thead>
<tr>
<th>Age</th>
<th>Sex</th>
<th>Aneurysm diameter (cm)</th>
<th>T-stage</th>
<th>Operation</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>69</td>
<td>M</td>
<td>7.0</td>
<td>T1</td>
<td>Transperitoneal. I-graft, right aortorenal bypass, left resection of renal tumour</td>
<td>Died 6 h postoperatively from myocardial infarction</td>
</tr>
<tr>
<td>80</td>
<td>F</td>
<td>5.0</td>
<td>T3a</td>
<td>Transperitoneal. Right nephrectomy. Y-graft 8 months later. Impending rupture</td>
<td>Alive 4 years later without recurrence</td>
</tr>
<tr>
<td>66</td>
<td>M</td>
<td>6.0</td>
<td>T3a</td>
<td>Transperitoneal. Left nephrectomy. I-graft 12 months later. Impending rupture</td>
<td>Alive 8 years later without recurrence</td>
</tr>
<tr>
<td>80</td>
<td>M</td>
<td>4.9</td>
<td>Metastasis</td>
<td>Assumed impending rupture. I-graft and removal of lymph nodes showing metastasis from renal carcinoma</td>
<td>Died on the 31th postoperative day of myocardial infarction following reoperation for intestinal obstruction</td>
</tr>
</tbody>
</table>

the patients were, however, elderly with additional cardiovascular diseases. In addition to these patients, the material included three cases with postoperative cholecystitis treated conservatively with antibiotics. Two of these had known cholelithiasis, and all patients are alive without symptoms.

Discussion

Concomitant intra-abdominal disease causes most concern in patients with aneurysmal disease. Most patients with obstructive aortoiliac disease have intermittent claudication and it is therefore possible to postpone an operation until other conditions have been taken care of. Furthermore, many of these patients can be treated by balloon angioplasty or stenting. In patients with AAA having a diameter of more than 5 cm, however, the risk of rupture usually represents an indication for surgery. A staged repair is often preferable in patients with concomitant malignancies, and in general the symptomatic lesion should be treated first. Thus, a large symptomatic aneurysm should have priority compared to a small carcinoma unlikely to cause haemorrhage or intestinal obstruction. In contrast, a large carcinoma-causing anaemia should be operated first in patients with small asymptomatic aneurysms.

Although controversial, we feel that only in rare cases is a combined procedure indicated. Such an indication could be a large symptomatic aneurysm in combination with a major carcinoma causing haemorrhage or obstruction. During combined procedures the aneurysm should be dealt with first and the graft covered thoroughly. Thereafter, intestinal resection should be performed using stapling instruments and minimal exposure of the intestinal mucosa. A temporary colostomy should be considered for left colonic anastomoses because of impaired colonic perfusion and the disastrous consequences if anastomotic leakage occurs. AAA repair can be performed safely in patients with a colostomy. We have experience from two such patients. The colostomy must be drained into a bag, thereby minimising the risk of leakage during the operation, while covering the colostomy may lead to contamination of the operating field. Furthermore, thorough sealing between the operating field and the colostomy is necessary. The use of rifampicin-soaked grafts may be advisable.

Some authors have reported a rather dismal prognosis following operations in patients having both gastrointestinal malignancy and AAA. According to our experience it seems justified to have an aggressive approach even in advanced cancers. However, if distant metastasis is observed, the aneurysm can probably be neglected unless one is faced with rupture or pain caused by expansion. In all our patients a staged operation was preferred. The optimal time interval between the two operations is controversial, but due to the risk of infection at least 1 month seems reasonable. An increased risk of aneurysm rupture following laparotomy has been reported. The mechanism of this phenomenon is unclear, but increased postoperative concentration of collagenase and elastase could be one explanation. Previous operations for carcinoma of the colon could predispose to sigmoid necrosis following AAA repair. The most likely explanation is that the collateral circulation to the bowel has been interrupted by the colon resection. Thus the circulation through the internal iliac arteries should be conserved during aneurysm repair whenever possible, as this artery represents an important collateral to this part of the bowel. Furthermore, the inferior mesenteric artery should be reimplanted in these cases whenever patent.

Only small series of concomitant renal carcinoma and AAA have been reported. In patients with large aneurysms a simultaneous operation for both conditions can be performed, whereas a staged procedure was preferred in two of our patients. In cases of left renal carcinoma both procedures can be performed through a retroperitoneal approach. This approach is
difficult on the right side, where a laparotomy is preferred. In patients with carcinoma of the urinary bladder, transurethral treatment is performed as a first procedure whenever possible. If there are indications for a radical cystectomy, it is recommended that aneurysm repair is carried out first. An indication for this approach is that staging of the retroperitoneal lymph nodes can then be performed simultaneously. This procedure will not be technically possible after the aneurysm has been repaired. If extensive metastasis to the lymph nodes are found during the staging procedure, a radical cystectomy may be unnecessary.

In this series the incidence of asymptomatic cholelithiasis was not recorded. The occurrence of various conditions may also have been underestimated in patients with ruptured aneurysm who are often haemodynamically unstable, and a thorough evaluation of the intra-abdominal organs may have been minimised or neglected to reduce the operating time. In total, we observed three patients with postoperative cholecystitis, two of which had known cholelithiasis. All of these patients survived without further symptoms. We feel that it is unjustified to remove an asymptomatic gall bladder containing stones during AAA repair due to the possibility of increasing the risk of graft infection. Furthermore, the risk of postoperative cholecystitis is probably small and the prognosis seems good if this complication occurs. Finally, about one-third of postoperative cholecystitis are likely to be acalculous, and these cases cannot be identified pre- or intraoperatively. If, on the other hand, cholecystitis or cholelithiasis causing recent symptoms is diagnosed before a planned operation for AAA, or is detected intraoperatively, cholecystectomy should be carried out as the primary procedure in most cases due to increased risk of graft infection. If there is a high risk that the aneurysm may rupture in the near future, for instance in patients with large aneurysms or in those having pain due to expansion, one might decide to perform a combined procedure. Following surgery for cholecystitis, an interval of at least 14 days is needed before aneurysm repair is undertaken.

A possibility which should be investigated in patients having concomitant intra-abdominal disease is whether endovascular treatment of the aneurysm is technically possible. One advantage with this method is that a second laparotomy is avoided, which could be advantageous if the first operation was performed because of intra-abdominal infection. A potential disadvantage with endovascular surgery is that the possibility of exploring intra-abdominal organs is absent. Therefore conditions like cholelithiasis or gastrointestinal cancer may not be diagnosed at the time of operation. Diverticulosis of the colon is often seen during operations for AAA. In general this condition can be neglected. However, diverticulitis must be treated before AAA repair is undertaken.

**Conclusion**

In conclusion, 2.6% of patients in our study had gastrointestinal or urogenital cancer. In patients with colorectal cancer the symptomatic lesion should generally be treated first. In patients with cholecystitis or symptomatic cholelithiasis, cholecystectomy is indicated prior to operation for AAA unless the aneurysm is also symptomatic when a combined procedure is probably justified. Asymptomatic cholelithiasis found incidentally during an operation for AAA should be left alone, as the occurrence of postoperative cholecystitis in this series was low and the prognosis excellent with a conservative regimen. The possibility of applying endovascular aneurysm repair should be considered, as this technique may have special advantages in patients with concomitant intra-abdominal disease.

**References**