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Management of Synchronous Infrarenal Aortic Disease and Large Bowel Cancer: a North-east of Scotland Experience

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Objectives: *to review our experience of combined aortic and colonic surgery.*
Design: *retrospective review.*
Methods: *synchronous aortic and colorectal procedures were identified from prospective computerised audit and archival vascular records. Clinical parameters were used as surrogates for measuring clinical outcome.*
Results: *six patients (F:M = 2:1), median age 75.6 years (range 70–80 years) were identified with infrarenal aortic pathology (5 aneurysms, median AP diameter 6 cm, 1 occluded aortoiliac segment) and colonic carcinoma. All carcinomas were Dukes stage B and moderately well differentiated. Synchronous aortic and colonic resections were performed in five cases, bypass for aortoiliac occlusion was deferred in preference to colonic resection in one case. Operating time ranged between 3–6.5 hours (median 4 h), transfusion requirements 2–5 units (median 3 units). One anastomotic dehiscence was reported. With follow-up between 6 months to 6 years all patients remain alive; no patient has re-presented with graft sepsis or symptomatic tumour recurrence.*
Conclusion: *synchronous resections of aortic and colonic lesion may be a treatment option in selected cases.*

Key Words: Aortic aneurysm; Colonic carcinoma; Combined management.

Introduction

Operative intervention for either aneurysmal or occlusive diseases of the infrarenal aorta is only indicated if a clear benefit to the patient can be reasonably expected. For large abdominal aortic aneurysms elective surgery eliminates the risks associated with acute rupture and emergency repair. For occlusive disease, surgery aims to relieve critical ischaemia and improve the patient's quality of life. However, the expected benefit from surgical treatment may be severely compromised if a second unexpected major pathology is discovered during laparotomy.

Synchronous colorectal cancer discovered during abdominal aortic surgery was first reported a little over 3 decades ago by Szilagyi *et al.*[1] In such circumstances, the surgical dilemma remains whether to delay resection of the incidental carcinoma until after recovery from the aneurysm repair (staged approach) or whether to perform concurrent resections (synchronous approach). There is little reliable and validated evidence in the available literature to substantiate the perceived risk/benefit associated with either treatment option. From the limited published literature[2–8] results appears to favour a staged approach unless the carcinoma is likely to cause acute complications.

We present our combined experience from a vascular unit of this uncommon synchronous condition.

Methods

The vascular unit at Aberdeen Royal Infirmary, U.K. provides a centralised vascular service to 550 000 people in the North-east of Scotland. A retrospective search was performed for all patients having undergone combined aortic and colorectal surgery between 1991 and 1998. Patients were identified from operating theatre registers, computerised audit and individual Consultant case records. Information appropriate to this review was extracted from the case notes and recorded on a standard data sheet. Operating times were obtained from anaesthetic charts. All tumours were staged according to the Dukes classification system. Follow-up data regarding survival were obtained

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from outpatient clinic visits or directly from general practitioners when appropriate. A Medline search (1966–1998) was performed to identify as many published relevant studies as possible reporting on the management of these synchronous pathologies.

Results

During the seven-year period 6 patients (4 female, 2 male), median age 75.6 years (range 70–80 years) were identified and these form our study sample. During this same period a total of 2800 colorectal cancers and 523 abdominal aortic aneurysms were also operated on at our hospital. Five of six patients presented with symptomatic infrarenal abdominal aortic aneurysm disease. In one of these patients, the abdominal aneurysm was associated with a known thoracic aortic aneurysm. Lifestyle-limiting aortoiliac occlusive disease (claudication) was the primary vascular pathology in one patient. The median anteroposterior dimension of these symptomatic abdominal aneurysms was 6 cm (range: 5–8 cm). All patients with aneurysm disease were prepared for surgery on a scheduled or emergency operating list.

Of the six large bowel cancers, three were located in the right colon, two in the sigmoid colon and two in the rectum (one in the upper rectum and one at 4 cm from the anal verge). In each case, histological examination of the resected specimen revealed a moderately well-differentiated adenocarcinoma, Dukes stage B, with a median size of 5 cm (range 4–6 cm).

In one case the surgical preference was to defer prosthetic bypass of the aortoiliac segment (for occlusive disease) until the patient had recovered from colonic surgery. The remaining five cases underwent a combined procedure. In each instance the aneurysm was repaired by an inlay technique with careful closure of the aneurysm wall around the graft. Following this the retroperitoneum was re-approximated and the duodenum intraperitonealised. In two cases, the vascular graft had been pre-soaked in rifampicin before insertion. In one case, flucloxacillin powder was sprinkled into the aneurysmal sac prior to closure.

In each case, following aneurysm repair and closure of the retroperitoneum, it was possible to perform a curative resection of the large bowel cancer. The operating vascular team performed operative resection for right-sided colonic cancers (three cases). In the remaining three left-sided colonic cancers, surgery was performed by a Consultant General Surgeon. One patient (tumour visible at 4 cm) underwent an abdominoperineal resection of the rectum. On-table colonic lavage was not performed prior to either of the two left-sided colorectal anastomoses.

All patients were classified as ASA grade 4. The mean Possum physiological severity score for all patients was 24 (range: 20–32) and the accompanying mean operative score was 26 (range: 13–31, Table 1). Operating time varied between 3–6.5 hours (median: 4 h). The median blood transfusion requirement was 3 units (range 2–5 units). Postoperative patients were routinely managed in a dedicated High Dependency Unit. Transfer to the ITU postoperatively was only necessary in one patient who required tracheostomy and ventilatory support.

Overall we observed four major postoperative complications (Table 2) but no hospital mortality. With follow-up of between 6 months to 6 years (median 36 months) all patients remain alive and as yet no case has presented with graft infection or symptomatic recurrence of carcinoma.

Discussion

The methodological indications and biases inherent in retrospective descriptive studies largely limit the precision of their results when comparing outcomes from different interventions. In our own experience the small sample size and non-randomised allocation of treatments (synchronous or staged) are particularly important biases influencing the results. Only a well-designed, pragmatic randomised clinical trial with adequate power, carefully selected inclusion/exclusion criteria, appropriate measures of outcome (both patient- and surgeon-orientated) and adequate lengths of follow-up could hope to scientifically address the issue of whether one treatment option is superior.[9] We discuss our findings within the context of these limitations and compare our experience with that reported in the published literature.

The diagnosis, indications for surgery and risk–benefit profile for both colonic carcinoma and aortic aneurysm diseases are well described. However, the patient risk–benefit profile may change dramatically if the operative findings are unexpected and the management controversial. To the surgeon, the risk of postoperative aneurysm rupture (if left unoperated), anastomotic dehiscence and graft sepsis are the main issues requiring consideration under such circumstances.

The occurrence of acute aneurysmal rupture during the postoperative period was initially reported two

Table 1. Risk profile.

Patient Age (Years) Sex	Procedure Vascular Colonic	Possum severity score Physiological/Operative score (Predicted mortality/morbidity %)	Operative time (Hours)	Transfusion (Units)
75 Female	AAA Anterior resection	23/24 (50/>90)	3.5	3
82 Male	AAA Sigmoid colectomy	20/29 (50/90)	3	3
74 Male	AAA APER	20/29 (50/90)	5.5	2
80 Female	AAA Right hemicolectomy	32/20 (90/90)	4	2
69 Female	AAA Right hemicolectomy	29/31 (90/90)	4	5
69 Female	Surgery staged Right hemicolectomy	25/13 (50/50)	2	0
	Aortobifemoral bypass 6 weeks later	22/20 (50/90)	4.5	3

AAA: Abdominal aortic aneurysm resection.
APER: Abdominal perineal resection of rectum.

Table 2. Complications.

Age (Years) Sex	Operative procedure	Complication	Outcome
75 Female	AAA/Anterior resection	Anastomotic dehiscence day 6	Hartmann's Discharged
69 Female	AAA/Right hemicolectomy	Aspiration pneumonia	Tracheostomy ITU Discharged
69 Female	Right hemicolectomy	Prolonged ileus Gangrenous toes	Conservative treatment Amputation of toes Discharged

decades ago by Swanson *et al.*[10] and Trueblood *et al.*[11] Swanson *et al.*[10] reported a series of ten patients in whom a previously asymptomatic aneurysm (mean diameter 9.4 cm) ruptured within 36 days (mean 10 days) of a prior laparotomy.

Trueblood reported four cases of postoperative aneurysm rupture amongst 17 patients with known abdominal aortic disease undergoing surgery for unrelated pathology. Their explanation for these ruptures was related to the levels of collagen lysis observed after surgery aggravated by poor nutrition, pyrexia and the postoperative metabolic state.[12,13] In addition, the matrix metalloproteinases (MMPs),[14] MMP inhibitors[15,16] and the vascular cell adhesion molecules (VCAMs)[17] are now known to be intimately involved. Although the aneurysms in this series were smaller than that reported by Swanson, they were all acutely symptomatic and therefore at high risk of postoperative rupture.

Adequate blood flow through both the macro (superior and inferior mesenteric arteries) and micro (perianastomotic channels) vascular channels are important determinants of successful colonic anastomotic healing. However, visual changes in the gross appearances of the colonic mucosa have been observed at endoscopy[18] and histological changes reported in colonic biopsies after AAA repair (16 of 53 patients, seven with no gross abnormality).[19] Together, these changes provide empirical evidence to support the occurrence of postoperative colonic ischaemia after AAA repair and support similar clinical findings reported 30 years ago by Bicks.[20] Presently, we remain unable to identify which patients will experience colonic ischaemia after aneurysm surgery. The importance of the fate of the IMA appears to be unknown. In this series, the IMA was suture-ligated and transected in three cases; in two, the artery was chronically occluded and left *in situ.* Interestingly, the anastomotic dehiscence occurring on day 6 after a colorectal anastomosis followed ligation of the IMA at the time of surgery.

Aortic graft sepsis occurs in approximately 1.3% of elective aneurysm repairs,[21] is commonly caused by *Staphylococcus aureus*, *Pseudomonas* and *Streptococcus* species[22,23] and may be associated with a mortality rate of up to 77% of cases.[24] Arguably the consequences

of converting a clean vascular operation to a dirty combined procedure is an increased risk of vascular graft sepsis. The risk of direct graft contamination by gut organisms may be reduced by a combination of bowel preparation, meticulous surgical technique and antimicrobial therapy. However, routine preoperative bowel preparation is not standard policy in our vascular unit for patients undergoing elective aortic surgery. On-table colonic lavage may appear attractive; however, it carries the potential risk of graft contamination secondary to peritoneal contamination or bacteraemia.

In conclusion, operative management for patients with previously undiagnosed colorectal cancer presenting during surgery for symptomatic aortic disease remains challenging. Despite the potential complications inherent with combined surgery, a good outcome can be achieved, as shown in this small series of non-randomised patients with Dukes stage B carcinomas. With follow-up between six months to six years, all patients remain alive and as yet no case has presented with graft infection. Our findings support similar findings reported by Oshodi *et al.*,[25] although only three of their nine cases included a diagnosis of colorectal cancer. Information regarding tumour recurrence in our series, however, remains limited, due to an incomplete cancer surveillance programme. An individualised approach to the operative management of a patient discovered to have coexisting colorectal cancer during aortic surgery remains essential, as guidance from the literature remains limited.

Good surgical judgements combined with meticulous operative and anaesthetic techniques remain powerful tools for aiding a successful outcome. Early contact and advice should be sought from surgeons experienced in the surgical management of colorectal cancer, as is our policy now. Risk–benefit assessment in determining operative strategy is best achieved by a critical and open-minded approach at the time of surgery. Scoring systems such as Possum[26] appear to overestimate the risk of combined procedures, predicting a mortality of at least 50% and morbidity of 90% (Table 1). Close co-operation between both vascular and gastrointestinal tract surgeons is important and a strong case has previously been made for all colorectal cancers to be resected by gastrointestinal tract surgeons.[27] It remains essential for vascular surgeons to be aware of the possibility of symptoms of colorectal cancer when considering a patient for AAA surgery. If there is concern, then full colorectal investigations should be performed prior to scheduling vascular surgery. Although such combined pathology is at present uncommon, future population-screening programmes for both abdominal aortic aneurysms[28] and colorectal cancer[29] may lead to an increase in the frequency with which these conditions are observed together at surgery

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References

1 Szilagyi DE, Elliott JP, Berguer R. Coincidental malignancy and abdominal aortic aneurysm: Problems of management. *Arch Surg* 1967; **95**: 402–412.
2 Morris HL, da Silva AF. Co-existing abdominal aortic aneurysm and intra-abdominal malignancy: reflections on the order of treatment. *Br J Surg* 1998; **85**: 1185–1190.
3 Gouny P, Leschi JP, Nussaume O *et al.* Single-stage management of abdominal aortic aneurysm and colon carcinoma. *Ann Vasc Surg* 1996; **10**: 299–305.
4 Weistein ES, Langsfeld M, DeFrang R. Current management of coexistent intra-abdominal pathology in patients with abdominal aortic aneurysms. *Semin Vasc Surg* 1995; **8** : 135–143.
5 Nakano H, Esato K, Ohara M, Mohri H. Surgical approach to abdominal aortic aneurysm with malignant alimentary tract tumour: report of three cases. *Journal of the Japan Surgical Society* 1986; **87**: 803–807.
6 Trede M, Storz LW, Petermann C, Schiele U. Pitfalls and progress in the management of abdominal aortic aneurysms. *World J Surg* 1988; **12**: 810–817.
7 Nora JD, Pairolero PC, Nivatvongs S *et al.* Concomitant abdominal aortic aneurysm and colorectal carcinoma: priority of resection. *J Vasc Surg.* 1989; **9**: 630–636.
8 Lobbat VJ, Rothenberg RE, LaRaja RD, Georgiou J. Coexistence of abdominal aortic aneurysm and carcinoma of the colon: A dilemma. *J Vasc Surg* 1985; **2**: 724–726.
9 Holmberg L, Baum M. Work on your theories. *Nature Med* 1996; **2**: 844–846.
10 Swanson RJ, Littooy FN, Hunt TK, Stoney RJ. Laparotomy as a precipitating factor in the rupture of intra-abdominal aneurysms. *Arch Surg* 1980; **115**: 199–304.
11 Trueblood HW, Williams DK, Gustafson JR. Aneurysmal rupture following resection of abdominal malignancy. *Am Surg* 1976; **42**: 535–539.
12 Hawley PR, Faulk WP, Hunt TK. Collagenase activity in the gastrointestinal tract. *Br J Surg* 1970; **57**: 896–899.
13 Anidjar S, Dobin PB, Chejfec G, Michael JB. Experimental study of determinants of aneurysmal expansion of the abdominal aorta. *Ann Vasc Surg* 1994; **8**: 127–136.
14 Woessner JF. Matrix metalloproteinases and their inhibitors in connective tissue remodelling. *FASEB J* 1991; **5**: 2145–2154.
15 Sakalihasan N, Delvenne P, Nusgens BV, Limet R, Laiere CM. Activated forms of MMP2 and MMP9 in abdominal aortic aneurysms. *J Vasc Surg* 1996; **24**: 127–133.
16 Tamarina NA, McMillan WD, Shively VP, Pearce WH. Expression of matrix metalloproteinases and their inhibitors in aneurysms and normal aorta. *Surgery* 1997; **122**: 264–271.
17 Patel MI, Melrose J, Ghosh P, Appleberg M. Increased synthesis of matrix metalloproteinases by aortic smooth muscle cells is implicated in the etiopathogenesis of abdominal aortic aneurysms. *J Vasc Surg* 1996; **24**: 82–92.
18 Shigematsu H, Nunokawa M, Hatakeyama T *et al.* Inferior mesenteric and hypogastric artery reconstruction to prevent

colonic ischaemia following abdominal aortic aneurysmectomy. *Cardiovasc Surg* 1993; **1**: 13–18.
19 Welsh M, Baguneid MS, McMahon RF *et al.* Histological study of colonic ischaemia after aortic surgery. *Br J Surg* 1998; **85**: 1095–1098.
20 Bicks RO, Bale GF, McBurney RF, Howard H. Acute and delayed colon ischaemia after aortic aneurysm surgery. *Arch Intern Med* 1968; **122**: 249–253.
21 Hallett JW Jr, Marshall DM, Petterson TM *et al.* Graft-related complications after abdominal aortic aneurysm repair: reassurance from a 36-year population-based experience. *J Vasc Surg* 1997; **25**: 277–284.
22 Mireeskandari M, Chalmers RTA, Cheshire NJW. Revision vascular surgery. In: Beard JD, Gaines PA, eds. *Vascular and Endovascular Surgery*. London: WB Saunders Company Ltd, 1998: 109–129.
23 van der Villet, Kouwenberg PP, Muytjens HL *et al.* Relevance of bacterial cultures of abdominal aortic aneurysm contents. *Surgery* 1996; **119**: 129–132.
24 Hannon RJ, Wolfe JHN, Mansfield AO. Aortic prosthetic infection: 50 patients treated by radical or local surgery. *Br J Surg* 1996; **83**: 654–658.
25 Oshodi TO, Abraham JS, Kelly JF. Simultaneous aortic aneurysm repair and colonic surgery. *Br J Surg* 1999; **86**: 217–218.
26 Copeland GP, Jones D, Walters M. POSSUM: a scoring system for surgical audit. *Br J Surg* 1991; **78**: 356–360.
27 Lothian and Borders Large Bowel Cancer Project. Immediate outcome of surgery. The consultant surgeons and pathologists of the Lothian health boards. *Br J Surg* 1995; **82**: 888–890.
28 Law M, Morris J, Wald N. Screening for abdominal aortic aneurysms. *J Med Screen* 1994; **1**: 110–116.
29 Towler BP, Irwig L, Glasziou P, Weller D, Kewenter J. Screening for colorectal cancer using the faecal occult blood test, Haemoccult. Cochrane Review, latest version 16 Jan 1998. In: The Cochrane Library, Oxford: Update Software.

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