Algorithms for the surgical management of retrorectal tumours

J. C. Woodfield¹, A. G. Chalmers², N. Phillips³ and P. M. Sagar¹

Departments of ¹Colon and Rectal Surgery, ²Radiology and ³Neurosurgery, General Infirmary at Leeds, Leeds LS1 3EX, UK
Correspondence to: Mr P. M. Sagar (e-mail: petersagar@aol.com)

Background: Retrorectal tumours are uncommon and may present a surgical challenge. The aim of this study was to identify a surgical strategy based on information gained from the multidisciplinary management of retrorectal tumours.

Methods: This was a retrospective review of 27 patients who had resection of retrorectal tumours between 1998 and 2006.

Results: The tumours included ten cystic lesions, two mature teratomas, four chordomas, seven neurogenic tumours, two sarcomas, one angiomyxoma and one gastrointestinal stromal tumour. The diagnosis was suggested initially by non-specific clinical presentation and palpation of a retrorectal mass on examination (16 patients), pelvic imaging (six), obstructed labour (one), recurrent pilonidal sinus (one), recurrent perianal sepsis (one) and return of symptoms after resection (two). Magnetic resonance imaging (MRI) confirmed the diagnosis and enabled surgical planning. The operative approach was perineal (12 patients), abdominal (11) or combined (four). Factors that influenced the operative approach were tumour position, its neoplastic nature, involvement of the pelvic sidewall or pelvic viscera, and size. The retrorectal tumour recurred in three patients.

Conclusion: A successful multidisciplinary surgical strategy, based on preoperative localization by MRI, has been developed for the treatment of retrorectal tumours.

Paper accepted 10 September 2007
Published online 12 October 2007 in Wiley InterScience (www.bjs.co.uk). DOI: 10.1002/bjs.5931

Introduction

Tumours that occur in the retrorectal space (the potential space between the mesorectum and the sacrum) comprise an uncommon and mixed group. Although the true incidence of such tumours is unknown, it is estimated at one in every 40,000 hospital admissions.¹,² Retrorectal tumours may be classified as congenital, neurogenic, osseous or miscellaneous.³⁻⁴ Two-thirds are congenital,³⁻⁶ caused by embryological sequestration, abnormalities in midline fusion and incomplete embryological regression. Cystic congenital lesions include epidermoid and dermoid cysts, tailgut cyst (also called cystic hamartoma or mucus-secreting cyst), enterogenic cyst, teratoma and teratocarcinoma. Neurogenic (including anterior sacral meningoceles), osseous and miscellaneous tumours each account for approximately 10 per cent of retrorectal tumours.³⁻⁷ Some 10 per cent of teratomas that present in or after the second decade of life undergo malignant transformation.⁴⁻⁸ Malignant transformation has also been documented in tailgut cysts.⁷ Infection occurs in up to 30 per cent of cystic lesions.⁹ In contrast to cystic lesions, chordomas are solid malignant tumours that arise from vestiges of the fetal notochord, usually from within the vertebral bodies. They are the most common solid retrorectal tumour.⁴⁻⁶,¹⁰,¹¹ These slow-growing tumours invade into adjacent structures and metastasize in approximately 20 per cent of cases.

Retrorectal tumours are often recognized late and may be managed suboptimally.⁷,¹²,¹³ Clinical diagnosis may be delayed because of non-specific symptoms combined with the omission of a rectal examination. Symptoms include pain, change in bowel habit, difficulty with micturition, and neurological signs in the lower limb and perineum.⁴⁻¹² The key to making a clinical diagnosis is the palpation of a smooth posterior extramucosal mass on rectal examination.⁴⁻⁶ Two specific clinical scenarios that should suggest a retrorectal tumour are a history of multiple procedures for a presumed perianal fistula or pilonidal sinus and vaginal canal obstruction preventing a normal vaginal delivery.⁴⁻⁶ The diagnosis is confirmed radiologically by means of computed tomography (CT) or
magnetic resonance imaging (MRI). Review of radiological images is often followed by biopsy, but this may introduce infection (biopsy of a meningocele may cause meningitis) and increase recurrence rates. Tumour seeding is a risk with malignant retrorectal tumours. Some authors suggest that there is an increased rate of chordoma recurrence after a diagnostic biopsy. A biopsy is required only if it will alter management, and is therefore unnecessary if preoperative imaging provides sufficient information to allow appropriate surgical management.

The optimal management of retrorectal tumours is surgical resection. This addresses symptoms, avoids subsequent infection or malignant transformation, and provides a definitive histological diagnosis. Curative resection requires complete excision of the tumour, with an intact capsule for clinically benign well circumscribed lesions and en bloc resection with microscopically clear resection margins for malignant tumours. The access and approach to the tumour depends on its location and morphology.

The aim of this study was to review recent surgical experience and to examine the contribution of MRI to preoperative decision-making in patients with retrorectal tumours.

**Methods**

The case notes of adult patients who underwent surgery for a retrorectal tumour by a multidisciplinary team between 1998 and 2006 were reviewed retrospectively. Locally advanced primary or recurrent rectal or uro-gynaecological cancer, metastatic cancer involving the sacrum, and primary osseous tumours were excluded. Patient demographics, symptoms, physical findings, investigations, surgical interventions, pathology and complications were all documented. Information was supplemented where necessary by means of a telephone interview with the patient or by contacting the referring hospital or general practitioner. The study was approved by the local research ethics committee.

Magnetic resonance images were reported by one experienced radiologist. Four features of the retrorectal tumour were assessed. First, the tumour location was defined by the most cephalad sacral vertebra involved. If the sacrum was not involved, the vertebral level in line with the upper edge of the tumour was recorded. Second, tumour size was measured in the largest two dimensions. Third, tumour morphology was assessed by examining the internal signal characteristics and the tumour margin. A predominantly cystic tumour was diagnosed when the lesion displayed cystic elements in excess of 80 per cent and a solid tumour when the lesion showed more than 80 per cent solid elements; the remainder were classified as heterogeneous. The circumference was noted to be sharply demarcated and smooth, or irregular. Finally, the tumour interface was assessed as clear, abutting on to, contiguous with, eroding into or invading adjacent structures. The tumour was considered to be abutting when there was a predominantly clear plane between the tumour and adjacent structures, apart from one point of contact. A more broad-based contact, but with no evidence of radiological invasion, was defined as contiguous. Adjacent structures assessed were the sacrum, pelvic sidewall and pelvic viscera. The sidewall was defined as all the bony and/or ligamentous boundaries of the pelvis, excluding the sacrum.

Three surgical approaches were used. The perineal approach was performed with the patient in the prone jack-knife position. A vertical midline skin incision was centred on the coccyx, with division of the anococcygeal ligament to achieve access to the retrorectal space. The origins of the gluteal muscles and sacrotuberous and sacrospinous ligaments were divided as required to facilitate dissection, division of the distal sacrum and delivery of the tumour. The anterior or abdominal approach was used with the patient in the modified Lloyd–Davis position. The combined approach involved a laparotomy with control of the median sacral artery and pelvic sidewall vessels, when indicated, followed by rectal mobilization with en bloc division of involved pelvic viscera. The abdomen was then closed and the patient placed in the prone jack-knife position. Sacral transection was performed at the planned level, enabling the distal sacrum, tumour and any viscer a divided during the abdominal dissection to be removed en bloc through the perineum.

The surgical approach was determined by the position of the tumour, involvement of the sacrum, pelvic sidewall or adjacent viscera, the benign or malignant appearance of the tumour, and its size. All 11 lesions below the middle of S3 (Fig. 1) without sacral, pelvic sidewall or visceral involvement were excised using the perineal approach. When the tumour was larger than 10 cm, or there was difficulty with access, a coccycgectomy, or excision of S5 with or without the S4 vertebral was performed; this permitted good exposure. One chordoma that involved S4 and S5 but not the rectum was excised by means of a perineal approach with an en bloc distal sacrectomy. The patient was then repositioned and a laparoscopic resection of a sigmoid colonic cancer was performed. An abdominal procedure was used for lesions below the middle of S3 with involvement of the pelvic sidewall or invasion of pelvic viscera to enable control of pelvic sidewall vessels and safe resection of the abdominal viscera.
When MRI showed involvement of both the sacrum and the pelvic viscera and/or sidewall, a combined approach was performed. All lesions above S3 (Fig. 2) were excised by means of an abdominal approach. The MRI and intraoperative appearances were used to determine whether a circumferential dissection on the capsule of the tumour or an en bloc resection was necessary. On nine occasions, a circumferential excision was performed and on one occasion an en bloc proctectomy. Figs 1–3 summarize the surgical management strategy for retrorectal tumours.

Measures to avoid complications

The positioning of the patient, Lloyd–Davies or prone jack-knife, was supervised by the surgeon. For patients in the latter position, the operating table was maximally flexed and the buttocks were spread with tape. Care was taken to avoid damage to the external anal sphincter. The surgeon’s left hand was double-gloved to permit the left index finger to be inserted into the anal canal and lower rectum so that the lesion could be pushed away from the deep recess of the wound to facilitate dissection. The transabdominal approach involved early control of the iliac vessels and identification of both ureters with use of ureteric stents as appropriate. The level of sacral division was chosen with the aid of screening radiology if there was any doubt. If an osteotomy was required at S3 or higher, at least one S3 nerve root was identified and protected. The neural sac was identified and ligated with a non-absorbable ligature. Blood loss in operations for large tumours was minimized by ligation of the middle sacral vessels and even the internal iliac vessels on the side of the greatest extension of the tumour.

Statistical analysis

Differences in sex ratio between patients with benign and those with malignant tumours were compared by means of Fisher’s exact test. Differences in age at presentation, tumour size and hospital stay after surgery were compared using the Mann–Whitney U test.
Adjacent structures involved?

Yes

Sacrum +/- pelvic viscera involved

Invasion of sacrum?

Yes

Combined approach: major sacral excision +/- pelvic stabilization +/- en bloc excision

No

Pelvic viscera involved

Invasion of pelvic viscera?

Yes

Abdominal approach: circumferential excision

No

No

Abdominal approach: en bloc excision

No

No

Abdominal approach: en bloc wedge excision

Fig. 2 Algorithm for the surgical management of retrorectal tumours above S3

Results

Twenty-seven patients underwent surgery for a retrorectal tumour. Patient demographics are presented in Table 1 and pathological diagnoses in Table 2. Three patients underwent excision for recurrent tumours (two tailgut cysts and one teratoma). All eight tailgut cysts occurred in women, of median age 30 (range 21–88) years, and three of the four chordomas occurred in men of median age 68 (range 57–77) years. Patients with benign lesions were significantly younger than those with malignant tumours ($P < 0.005$) (Table 1). The diagnosis was suggested initially by non-specific clinical presentation and palpation of a retrorectal mass on examination (16 patients), pelvic imaging (six), obstructed labour (one), recurrent pilonidal sinus (one), recurrent perianal sepsis (one) and return of symptoms after resection (two). Clinical presentation is summarized in Table 1. Symptoms were present for more than 1 year in 11 of 27 patients.

Preoperative MRI of the pelvis was the preferred imaging technique for assessment of retrorectal tumours (Table 3). It was used to determine the surgical approach and subsequent resection technique by documenting the position of the mass with respect to the sacrum. Ten tumours extended proximal to S3 and 17 were positioned adjacent to the S3–5 vertebrae. MRI was useful in predicting whether a tumour was benign or malignant. A cystic (usually unilocular) tumour with a smooth, well circumscribed margin and no features of invasion or enhancement with gadolinium was benign.
Table 1  Demographics, presentation and results of surgery

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Benign (n = 20)</th>
<th>Malignant (n = 7)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)*</td>
<td>30 (21–88)</td>
<td>60 (47–77)</td>
<td>&lt; 0.005†</td>
</tr>
<tr>
<td>Sex ratio (M:F)</td>
<td>6:14</td>
<td>4:3</td>
<td>0.350:</td>
</tr>
<tr>
<td>Clinical presentation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Symptoms</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pain (back, sacrum, perineum)</td>
<td>6</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Perineal lump or tenesmus</td>
<td>6</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Change in bowel habit</td>
<td>4</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Urinary symptoms</td>
<td>1</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Lower-extremity symptoms</td>
<td>2</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Discharging sinus</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Asymptomatic</td>
<td>3</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>In pregnancy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obstructed labour</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Detected at antenatal ultrasoundography</td>
<td>2</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Signs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mass on PR/PV examination</td>
<td>14</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Mass on perineal examination</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Lower extremity signs</td>
<td>2</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Intervention before definitive</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>treatment Biopsy</td>
<td>3</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Partial excision</td>
<td>3</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Drainage</td>
<td>3</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Surgery and outcomes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean size of tumour (cm)</td>
<td>8.9</td>
<td>11.6</td>
<td>0.110:</td>
</tr>
<tr>
<td>Abdominal approach</td>
<td>10</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Perineal approach</td>
<td>9</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Combined approach</td>
<td>1</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Transfusion requirement</td>
<td>3</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Time to discharge (days)*</td>
<td>6 (4–11)</td>
<td>20 (9–36)</td>
<td>&lt; 0.005†</td>
</tr>
<tr>
<td>Incomplete excision</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Recurrence</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

*Values are median (range). PR/PV, rectal/vaginal. †Mann–Whitney U test; ‡Fisher’s exact test.

A heterogeneous tumour, or a primary tumour with an irregular margin, was usually malignant. Exceptions included two benign ganglioneuromas that displayed heterogeneous signal intensity and two recurrent benign tumours with an irregular margin. The ability to diagnose malignancy in a solid tumour with a smooth margin was more uncertain; two benign neurogenic tumours and a sarcoma displayed such features. However, the radiological assessment of solid tumours that were not of sacral origin was useful in suggesting their likely origin.

The seven neurogenic tumours were all in contact with the anterior surface of the proximal sacrum, the two sarcomas were inseparable from the pelvic floor and the gastrointestinal stromal tumour (GIST) appeared to arise from the rectum. MRI was also helpful in assessing whether the tumour was inseparable from the pelvic sidewall or adjacent pelvic viscera (Table 4). The MRI finding of tumour abutting the pelvic viscera or pelvic sidewall was confirmed at surgery in all 16 patients, and surgical dissection between the tumour and adjacent structure was performed successfully. Invasion demonstrated on MRI in six patients was confirmed at surgery. This included four chordomas that had invaded the sacrum. MRI also gave accurate information about invasion of the rectum. The chordomas appeared as solid or predominantly solid lesions with less precise margins that were enhanced with gadolinium. The other two lesions that showed radiological invasion comprised a GIST arising from the rectum and a recurrent tailgut cyst that invaded through the sciatic notch. One epidermoid tumour, with a benign appearance on MRI, was found at operation to be eroding into the sacral cortex. This was removed completely by following the plane of dissection along the capsule of the tumour. On four occasions, there was a contiguous area of direct contact between the tumour and adjacent structures. In the patient with a recurrent teratoma, there was no plane for dissection and a significant pelvic clearance, including a distal sacrectomy, was necessary; a plane of dissection was present in the other two patients, who had schwannomas.

The median postoperative hospital stay was 9 (range 4–36) days overall, 7 (range 5–11) days after a perineal procedure, 7–5 (range 4–10) days after an abdominal procedure and 27 (range 11–36) days after a combined procedure.

No patient died within 30 days of surgery. Three patients developed a wound infection and one had an intraoperative pneumothorax. No patient developed neurological complications, cerebrospinal fluid leak or perineal herniation, and there were no subsequent obstetric difficulties. Closure of the wound in each case was by primary closure.

Median follow-up for the 20 patients with benign tumours was 49 (range 2–72) months; one patient developed recurrence of a tailgut cyst extending through...
Table 4 Comparison of magnetic resonance imaging margin and surgical margin

<table>
<thead>
<tr>
<th>Nature of margin found at surgery</th>
<th>Lift off</th>
<th>Dissect off</th>
<th>Inseparable</th>
<th>Invasion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abutting</td>
<td>4</td>
<td>12</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Contiguous area</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Eroding (into sacral cortex)</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Invasion</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>6</td>
</tr>
</tbody>
</table>

Abutting, tumour touches an adjacent structure; contiguous, there is a significant area of contact between the tumour and the adjacent structure.

Discussion

Based on review of the clinical, MRI and surgical findings in this series of 27 patients with retrorectal tumours, the following conclusions and recommendations can be made. First, cystic lesions with a smooth wall on MRI are typically benign, whereas heterogeneous tumours are usually (but not always) malignant. Recurrent benign tumours may be heterogeneous and/or have an irregular margin. Review of the original histology is important and resection may be a challenge. Second, lesions that abut adjacent structures on MRI, but which do not invade or have a significant area of direct contact, can be excised circumferentially, as can radiologically benign lesions that are contiguous with adjacent viscera or erode into the sacral cortex. Third, chordomas can be diagnosed radiologically; these are typically heterogeneous tumours that arise from and cause significant destruction of the sacrum. MRI can also give additional information about potential rectal involvement. Fourth, solid lesions that arise from muscle, visera and nerves (in this study sarcoma, GIST, schwannoma and ganglioneuroma) may be benign or malignant, and imaging may demonstrate benign and malignant features. Features that point to the likely origin of the lesion should be sought on magnetic resonance images, as this may suggest the probable diagnosis. There will, however, still be an element of uncertainty about whether the tumour is malignant. An en bloc resection is required when the lesion invades or arises from a pelvic visceral organ. For other lesions, a circumferential excision with a clear margin is recommended. If adjacent structures dissect away without difficulty, they may be safely left in situ. However, if the adjacent viscera are firmly adherent, extended circumferential excision is recommended rather than compromising the margin of what might prove to be a malignant tumour.

These observations, combined with knowledge about tumour location and size, its malignant potential and margin characteristics, have allowed the formulation of algorithms for the management of retrorectal tumours (Figs 1–3). The first decision, the operative approach, uses information that can be obtained from preoperative MRI, and in this series was always accurate. The second decision, the oncological approach (en bloc resection, extended circumferential resection or circumferential resection), uses information from preoperative MRI and intraoperative findings. These algorithms serve as a clinical guide; they are not designed to be all encompassing as this would increase their complexity and correspondingly decrease their clinical value.

The first step in determining tumour position is to assess its cephalad extent with respect to the sacrum. If the tumour is positioned below the mid-body of S3, a perineal approach can be considered. This corresponds to the clinical observation that a perineal approach should be possible if the superior border of the tumour can be palpated on digital rectal examination.15 All tumours that extend above S3 require an abdominal or combined approach (Fig. 2). The advantages of the abdominal approach include good access to the pelvis, pelvic viscera and pelvic sidewall. This permits proximal vascular control and mobilization of the rectum and other viscera. The next step is to assess whether the tumour involves the sacrum, pelvic sidewall or adjacent visera, that is whether there is radiological evidence of invasion, erosion or a significant area of direct contact. If there is invasion into adjacent structures, an en bloc resection is required, for example en bloc sacrectomy if tumour has invaded the sacrum. The morbidity of such surgery may be significant, with division of the second sacral vertebrae carrying the risk of bilateral S2 nerve root damage, double incontinence and sexual dysfunction.15,16

Fig. 1 outlines the recommended approach for tumours sited lower in the pelvis. A perineal approach is preferred where possible as this usually results in a quicker recovery, although in the present series a perineal procedure was not associated with shorter postoperative hospital stay.
than an abdominal approach. The perineal approach also gives excellent access to low tumours, but an abdominal procedure is necessary when the tumour is high (inability to access the superior pole of the tumour), the sidewall is involved (risk of uncontrolled bleeding) or there is invasion of pelvic viscera (potentially requiring an en bloc resection). When adjacent structures are not involved and a perineal approach is used, access can be improved by performing a distal sacrectomy, with minimal morbidity.

When adjacent structures are involved, a combined approach is recommended. This is usually necessary for distal sacral chordomas, and was used for three chordomas in the present study; all extended to the S3–S4 junction or into S3, involved the rectum or mesorectum and were larger than 11 cm. The fourth chordoma extended into but no higher than S4 and did not involve the rectum; it was therefore removed by en bloc distal sacrectomy (extending into S3) using a perineal approach. Figs 4 and 5 show examples of chordomas and how their position influences the operative approach. Other ‘low’ approaches to the retrorectal space have been described, including transvaginal, transrectal and intersphincteric approaches. However, the authors believe that they have no advantage over the standard posterior approach and may compromise the ability of the surgeon completely to excise the lesion as they often offer poor exposure.

When the retrorectal tumour is contiguous with adjacent structures, but there is no radiological evidence of invasion (Fig. 3), the approach to the tumour depends on the MRI appearance and intraoperative findings. If MRI suggests that the tumour is benign (cystic, smooth wall), a plane of dissection can usually be developed between the tumour and adjacent structures. In the present series three solid tumours with a smooth outline in the presacral position were benign schwannomas and were excised using a circumferential excision (Fig. 6). However, an extended resection should be performed if the tumour does not lift away from adjacent structures.

Surgical planning was possible because of the accuracy of the information provided by MRI. The role of MRI is not to make an exact diagnosis, but to determine whether the tumour is likely to be malignant and allow assessment...
of the surrounding tissue planes. MRI may diagnose the
tumour as benign, malignant or uncertain, but was not
helpful in assessing recurrent benign tumours. MRI may
also assess the margin as intact, uncertain or invading
adjacent structures. When MRI was ‘uncertain’, it still
gave additional information about the likely origin of the
tumour, its morphology and adjacent tissue planes.

A further benefit of MRI was in confirming that
routine preoperative biopsy was unnecessary. When
preoperative MRI is available, the indications for biopsy
(ideally under CT guidance) can be limited to patients
whose mass may represent metastatic disease or lymphoma.
The risks of a routine biopsy can therefore be avoided
without any compromise to patient management.

Retrorectal tumours are best managed by definitive
surgery. In view of the rarity of such lesions and
the potential difficulty of operations, referral to a centre
of expertise is necessary. As the first operation offers
the best chance of cure, this should be performed by
surgeons who are able to operate safely in the retrorectal
space and perform sacral excision when necessary. This
requires a team that may include a colorectal surgeon,
a neurosurgery or orthopaedic surgeon and possibly a
urologist. A radiologist is also an essential team member
because accurate interpretation of magnetic resonance
images is the pivotal part of preoperative planning. With
such a multidisciplinary approach to the management of
retrorectal tumours, there is a good chance of successful
excision with a low risk of recurrence.

References

1 Whittaker LD, Pemberton JD. Tumors ventral to the
2 Wolpert A, Beer-Gabel M, Lifschütz O, Zbar AP. The
management of presacral masses in the adult. Tech Coloproctol
3 Lovelady SB, Dockerty MB. Extrapelvic pelvic tumors in
4 Jao S-W, Beart RW Jr, Spencer RJ, Rieman HM,
Istrup DM. Retrorectal tumors: Mayo Clinic experience,
5 Uhlig BE, Johnson RL. Presacral tumors and cysts in adults.
6 Hobson KG, Ghaemmaghami V, Roe JP, Goodnight JE,
Khatri VP. Tumors of the retrorectal space. Dis Colon Rectum
7 Dozois RD, Chiu LK. Retrorectal tumors. In Surgery of the
Colon and Rectum, 3rd edn, Nicholls RJ, Dozois RR (eds). Churchill
8 Head HD, Gertein JD, Muir RW. Presacral teratoma in the
9 Abel ME, Nelson R, Prasad ML, Pearl RK, Orsay CP,
Abcarian H. Parasacrococcygeal approach for the resection of
retrorectal development cysts. Dis Colon Rectum 2005; 48:
855–858.
10 Freier DT, Stanley JC, Thompson NW. Retrorectal tumors
11 Cody HS, Marcove RC, Quan SH. Malignant retrorectal
tumors: 28 years’ experience at Memorial Sloan-Kettering
12 Glasgow SC, Birnbaum EH, Lowrey JK, Fleshman JW,
Kodner IJ, Mutch DG et al. Retrorectal tumors: a diagnostic
and therapeutic challenge. Dis Colon Rectum 2005; 48:
1581–1587.
13 Singer MA, Cintron J, Martz JE, Schoetz DJ, Abcarian H.
14 Localio SA, Eng KJ, Ranson HC. Abdominosacral approach
15 Biagini R, Ruggieri P, Mercieri M, Capanna R, Briccoli A,
Perin S et al. Neurological deficit after resection of the
16 Jackson RJ, Gokaslan ZL. Spinal–pelvic fixation in patients
61–70.
A gaze in the crystal ball: Where is the role of virtual reality and artificial Intelligence in colorectal surgery
Müller Beat, Basel, CH

MALIGNANT COLORECTAL DISEASE

Cytoreductive Surgery and Intraperitoneal Chemotherapy – facts and hopes
Michel Adamina, Winterthur, CH

Metastatic Colorectal Cancer – surgical approaches and limits
Jürgen Weitz, Dresden, DE

Extended lymph node dissection for rectal cancer, is it still under debate?
Miranda Kusters, Amsterdam, NL

Organ preservation functional outcome in rectal cancer treatment – in line with patient’s needs?
(Robot – laparoscopic – open surgery?)
Hans de Wilt, Nijmegen, NL

ROBOTICS

Advances in Robotic Surgery and what we learnt so far
Parvaiz Amjad, Portsmouth, UK

Challenging the market: Robotic (assistant) Devices and how to choose wisely
(Da Vinci – Hugo Ras – Distalmotion ua)
Khan Jim, London, UK

TAMIS - Robotic Transanal Surgery, does it make it easier?
Knol Joep, Genk, BE

Live Surgery – Contonal Hospital of St.Gallen
Walter Brunner, St.Gallen, CH; Salvadore Conde Morals, Sevilla, ES; Friedrich Herbst, Vienna, AUT; Amjad Parvaiz, Portsmouth, UK

Video Session

Lars Pahlmann Lecture
Markus Büchler, Lisboa, PRT

Honorary Lecture
Bill Heald, Lisboa, PRT