Abstract
Intersphincteric resection (ISR) is regarded as the most extreme form of resection of ultralow rectal cancers. ISR for low rectal carcinoma is a demanding operation, whose outcome in terms of morbidity, mortality, local recurrence rates, survival, functional results and patients' quality of life can vary greatly. Postoperative morbidity and mortality rates, as well as oncological results, are relatively acceptable, with a mean operative mortality and anastomotic leak rate following ISR of 1.6% and 10.5% respectively, while local recurrence rate is 9.5% and systemic recurrence rate 9.3%. Patients must be counselled to expect inferior functional results compared with those normally experienced following anterior resection, although the formation of a j-pouch can improve these symptoms. Careful case selection with appropriate assessment of anorectal function is recommended. Neoadjuvant radiotherapy could improve rates of local recurrence, but may have a negative impact on postoperative function.

Introduction
Treatment of low rectal cancer still remains a challenge. Traditionally, abdominoperineal resection of rectum (APR) and end colostomy was the operation of choice for low rectal carcinomas located within 5 cm from the anal verge. However, a therapeutic decision that involves sphincter resection and permanent colostomy is a therapeutic decision that places serious limitations on the quality of life. Nowadays, better biological knowledge of rectal cancer, improvement of surgical techniques, use of anastomotic stapling devices, better understanding of the physiology of the sphincteric mechanism and the ability of pre- or postoperative chemotherapy and radiotherapy, have all contributed to the radical modification of low rectal cancer treatment, thereby increasing the number of successful sphincter saving procedures (SSPs). Today, 70-90% of low rectal cancer cases are treated with SSPs in specialized colorectal units, versus 39.7% in general surgical units where APR is applied in 60.3% of cases [1,2,3]. In our department, over the last 5 years, we have performed 169 SSPs out of 226 cases of low rectal cancer [74.8%] within 6 cm from the anal verge and 57 APRs [25.2%]. Essential prerequisites for SSPs are the safety and radicality of the operation to ensure that morbidity and mortality rates are comparable with those of APR. Another vital consideration in the decision to perform an SSP is the anatomical and functional status of the anal sphincter, since SSP can cause increased frequency of defecation, faecal urgency, incomplete defecation and incontinence. Sphincter saving procedures performed for low rectal cancer usually involve:

- Very low anterior resection with low anastomosis in the distal rectum or at the level of the pelvic floor, or coloanal anastomosis, straight or with interposition of a transverse coloplastic or a colonic J-pouch
- Intersphincteric resection of the rectum with a coloanal anastomosis
- Transanal local excision of the tumour
- Transanal endoscopic microsurgery [TEM]
- Sacral approaches

Intersphincteric resection is regarded as the most extreme form of resection of ultralow rectal cancers. First described by Parks and Percy in patients with non-malignant diseases [4], it was re-established 10 years later by Schiessel et al for very low rectal cancers[5]. Nowadays, it is generally accepted that the results of a very low anterior resection are comparable to those of APR. However, reported local recurrence rates vary [6-28%] from surgeon to surgeon and from hospital to hospital [6].
Factors influencing local recurrence and survival after a very low anterior resection are:

A. Tumour characteristics:
   - histologic differentiation
   - lymph node infiltration
   - tumour distance from sphincters
   - extramural infiltration
   - Tumour fixation and infiltration of adjacent tissues [7,8,9]

B. Surgeon-dependent factors:
   - ability to perform Total Mesorectal Excision [TME]
   - identification and preservation of sacral nerves
   - ability to achieve distal margins free of tumour
   - ability to construct a tension-free stapled or handsewn low anastomosis

C. Chemoradiation [10-18]

Moreover numerous studies have shown that 81-95% of low rectal cancer cases present distal intramural spread less than 1cm from the tumour margin [17,19,20].

Distal intramural spread of rectal carcinomas is correlated with Dukes stage, tumour size, depth of invasion and lymph node infiltration [21] [Table 1].

Table 1 Correlation of distal intramural spread of rectal carcinomas with Dukes stage, tumour size, depth of invasion and lymph node infiltration, according to Andreola et al [21].

<table>
<thead>
<tr>
<th>Tumour parameters</th>
<th>Distal intramural spread</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dukes stage</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>15%</td>
</tr>
<tr>
<td>B</td>
<td>21%</td>
</tr>
<tr>
<td>C</td>
<td>60%</td>
</tr>
<tr>
<td>Tumour size</td>
<td></td>
</tr>
<tr>
<td>&lt;10mm</td>
<td>0%</td>
</tr>
<tr>
<td>11-40 mm</td>
<td>27%</td>
</tr>
<tr>
<td>&gt;40mm</td>
<td>51%</td>
</tr>
<tr>
<td>T2</td>
<td>30%</td>
</tr>
<tr>
<td>T3</td>
<td>50%</td>
</tr>
<tr>
<td>N0</td>
<td>18%</td>
</tr>
<tr>
<td>N1</td>
<td>40%</td>
</tr>
<tr>
<td>N1 [2 LN+]</td>
<td>75%</td>
</tr>
</tbody>
</table>

For low rectal carcinomas (<5 cm from the anal verge) a distal resection margin of 1cm is oncologically acceptable [21-24].

In patients with low rectal carcinomas, at a distance of less than 1-2 cm from the dentate line, a safe distal margin is achieved only by the resection of the upper part of internal sphincter.

The selection of patients for intersphincteric resection is based on preoperative clinical, histological and laboratory criteria.

Prerequisites for intersphincteric resection include local spread restricted to the rectal wall or internal sphincter, sufficient sphincter function and continence and favourable tumour histology.

Risk factors for intramural spread in very low rectal carcinomas

Gross pathological appearance of tumour type 3 (ulcerative with infiltration), 3/4 or more annularity and unfavourable histology in the submucosal field, including positive tumour budding, poor differentiation and vascular invasion, are all considered to represent high risk factors [25].

As demonstrated by the same authors, the incidence of intramural spread increases with the number of risk factors. Specifically, the incidence of intramural spread was 3.3% in the no-risk group, 9.1% in the one-risk factor group and 29.1% in the multiple risk factor group [25].

According to Hohenberger et al, the 3% rate of intersphincteric resections recorded for the period 1985-94 increased to 27% between 1995 and 2001 [26].

In our department, intersphincteric resection of the rectum represents just 10.05% of the total number of SSPs.

Surgical technique

The surgical technique includes the following steps:
   - Mobilization of the left colon and splenic flexure
   - High ligation of the Inferior mesenteric artery and vein
   - Preservation of the presacral autonomic nerves
   - Total mesorectal excision
   - The application of a self-holding retractor [Lone Star Retractor] into the anal canal to guarantee comfortable access to this area
   - Injection of vasoconstricting factors into the intersphincteric space to reduce bleeding in this area and improve dissection
   - A circular incision of the anoderm that facilitates the exposure of the internal sphincter, identified as a white band-like structure
   - The incision of the internal sphincter, below the dentate line or 0.5 to 1 cm beneath and separation of the external sphincter and puborectalis [Fig. 1].

Separating the rectum from the prostate and the seminal vesicles or vagina can be easily performed. For tumours spreading to or beyond the dentate line, some authors completely excise the internal sphincter, entering the intersphincteric space through the intersphincteric groove.

In cases of T3 tumours, puborectalis and/or the external sphincter can be partially removed [27,28,29].