Review Article
Laparoscopic surgery for colorectal cancer in China: an overview

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Abstract: Since its introduction into China in 2001, laparoscopic techniques have been extensively used for the surgical management of colorectal cancer during the last two decades in China. Like all the pioneers of the technique, Chinese gastrointestinal surgeons claim that laparoscopic surgery for colorectal cancer led to faster recovery, shorter hospital stay and more rapid return to daily activities respect to open surgery while offering the same functional and oncological results. There has been booming interest in laparoscopic surgery for colorectal cancer since 2006 in China. The last decade has witnessed national growth in the application of laparoscopic surgery for colorectal cancer and yielded a significant amount of scientific data to support its clinical merits and advantages. However, few prospective randomized controlled trials have investigated the benefits of laparoscopic surgery for colorectal cancer in China. In this article, we make an overview of the current data and state of the art of laparoscopic surgery for colorectal cancer in China.

Keywords: Colon cancer, rectal cancer, laparoscopic surgery, review

Introduction
Colorectal cancer is one of the leading causes of mortality worldwide [1]. Traditionally, cancers of the colon were removed through large abdominal incisions. Since the advent of laparoscopic surgery, it has become clear that patients benefit from a minimally invasive approach in a variety of ways [2]. In 1991, laparoscopic-assisted colectomy was first reported [3, 4]. Due to the development of minimally invasive techniques, the majority of colorectal procedures can be performed using a laparoscopic approach, and the indications for laparoscopic surgery have gradually expanded [5, 6]. A number of available prospectively randomized trials and meta-analyses of laparoscopic surgery for colorectal cancer [7-12] reported that laparoscopic-assisted colorectal surgery exhibited improved post-operative results, including less pain, a smaller incision, a faster recovery of gastrointestinal function, a shorter post-operative hospital stay and similar long-term survival, compared with those of open colorectal surgery [13, 14]. Therefore, laparoscopic-assisted surgery has been widely accepted as an alternative to conventional open surgery for colorectal cancer.

Because of the potential advantages, such as less invasiveness and postoperative pain, earlier recovery, better cosmetic results, milder morbidity, earlier time to walking, flatus, and oral intake, and quicker recovery with a shorter hospital stay, laparoscopic surgery for colorectal cancer was introduced into clinical practice in China in 2001 [15], and was gradually implemented and is now commonplace in China. There has been booming interest in laparoscopic surgery for colorectal cancer since it was first described in 2001 [15]. The last decade has witnessed national growth in the application of laparoscopic surgery for colorectal cancer yielding a significant amount of scientific data to support its clinical merits and advantages. With the development of laparoscopic techniques and the invention of new surgical equipments, scarless surgery is becoming increasingly popu-
Laparoscopic surgery for colorectal cancer in China

One hundred and seventeen suitable papers, consisting of prospective and retrospective studies, were identified \[16-131\]. Key outcomes of major studies written in English are summarized in the Tables 1 and 2 \[16, 17, 19, 21-25, 27, 30-32, 35-37, 39-43, 45, 46, 48, 49, 50-52, 54, 56, 57, 63, 65, 66, 68, 69-71, 73-75, 79, 82-84, 89, 90-92, 95, 97, 99, 104, 107-114, 116, 118, 121, 122, 125-130\]. Twenty nine of these were performed prospectively \[24, 25, 30, 35, 42, 51, 63, 65, 66, 68, 73, 79, 83, 84, 89, 91, 97, 99, 104, 109, 110, 116, 118, 121, 125, 127-130\], in which nine studies were prospective randomized controlled trials \[30, 35, 63, 65, 73, 83, 99, 116, 127\]. Common outcome measures includes operative data (operative time, estimated blood loss and conversion rate), short-term outcomes (days to liquid diet, days to flatus, and total hospital stay), complications (anastomotic stenosis, anastomotic bleeding, and anastomotic leakage), postoperative mortality data, overall survival, disease-free survival and follow-up period.

Surgical approaches

Surgical approaches of laparoscopic surgery for colorectal cancer performed by Chinese gastrointestinal surgeons are listed in Table 1, which includes multiport laparoscopic surgery (MLS), single-incision laparoscopic surgery (SILS), natural orifice specimen extraction (NOSE), natural orifice transluminal endoscopic...
Table 1. Survey over major reports of laparoscopic surgery for colorectal cancer in China: operative data (Articles in English)

<table>
<thead>
<tr>
<th>Ref.</th>
<th>PS/RS</th>
<th>Patient (n)</th>
<th>Approaches</th>
<th>TME</th>
<th>LN</th>
<th>NeoA</th>
<th>OT (min)</th>
<th>BL (ml)</th>
<th>C n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>[16]</td>
<td>RS</td>
<td>197</td>
<td>NOSE/MLS</td>
<td>Yes</td>
<td>17.0 ± 8.3 in NOSE; 18.9 ± 11.6 in MLS</td>
<td>No</td>
<td>111.6 ± 25.4 in NOSE; 115.3 ± 23.0 in MLS</td>
<td>70.2 ± 66.1 in NOSE; 126.3 ± 58.6 in MLS</td>
<td>NA</td>
</tr>
<tr>
<td>[17]</td>
<td>RS</td>
<td>119</td>
<td>MLS</td>
<td>Yes</td>
<td>22.3 ± 8.6</td>
<td>No</td>
<td>257.8 ± 67.6</td>
<td>100 (100-200)</td>
<td>9 (7.6)</td>
</tr>
<tr>
<td>[19]</td>
<td>RS</td>
<td>80</td>
<td>MLS</td>
<td>Yes</td>
<td>11.86 ± 1.95</td>
<td>No</td>
<td>201.7 ± 6.91</td>
<td>97.25 ± 9.97</td>
<td>1 (1.3)</td>
</tr>
<tr>
<td>[21]</td>
<td>RS</td>
<td>289</td>
<td>MLS</td>
<td>Yes</td>
<td>NA</td>
<td>NA</td>
<td>155 ± 29</td>
<td>128 ± 24</td>
<td>NA</td>
</tr>
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<td>[23]</td>
<td>RS</td>
<td>24</td>
<td>NOSE</td>
<td>Yes</td>
<td>NA</td>
<td>NA</td>
<td>110.0</td>
<td>69.1 mL</td>
<td>NA</td>
</tr>
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<td>[24]</td>
<td>PS</td>
<td>21</td>
<td>NOSE</td>
<td>Yes</td>
<td>17.8 ± 4.6</td>
<td>NA</td>
<td>132 ± 85</td>
<td>84 ± 15</td>
<td>NA</td>
</tr>
<tr>
<td>[25]</td>
<td>PS</td>
<td>51</td>
<td>MLS</td>
<td>Yes</td>
<td>NA</td>
<td>Yes</td>
<td>181.5 (95.0-310.0)</td>
<td>204.7 (80.0-1000.0)</td>
<td>NA</td>
</tr>
<tr>
<td>[27]</td>
<td>RS</td>
<td>64</td>
<td>MLS</td>
<td>Yes</td>
<td>11.68 ± 5.69</td>
<td>No</td>
<td>183 ± 55</td>
<td>168 ± 106</td>
<td>NA</td>
</tr>
<tr>
<td>[30]</td>
<td>PS</td>
<td>70</td>
<td>35 in NOTES; 35 in MLS</td>
<td>Yes</td>
<td>12 (6-33) in NOTES; 12 (6-29) in MLS</td>
<td>NA</td>
<td>105 (60-170) in NOTES; 100 (59-210) in MLS</td>
<td>30 (10-50) in NOTES; 30 (10-100) in MLS</td>
<td>NA</td>
</tr>
<tr>
<td>[32]</td>
<td>RS</td>
<td>87</td>
<td>MLS</td>
<td>Yes</td>
<td>14 ± 5</td>
<td>NA</td>
<td>160 ± 40</td>
<td>28 ± 5</td>
<td>NA</td>
</tr>
<tr>
<td>[39]</td>
<td>RS</td>
<td>67</td>
<td>MLS</td>
<td>Yes</td>
<td>20.3 ± 8.3</td>
<td>NA</td>
<td>216.4 ± 68.3</td>
<td>86.9 ± 37.6</td>
<td>NA</td>
</tr>
<tr>
<td>[45]</td>
<td>RS</td>
<td>177</td>
<td>MLS</td>
<td>Yes</td>
<td>15.2 ± 10.1</td>
<td>No</td>
<td>133 ± 36</td>
<td>94 ± 34</td>
<td>5 (2.82)</td>
</tr>
<tr>
<td>[48]</td>
<td>RS</td>
<td>381</td>
<td>MLS</td>
<td>Yes</td>
<td>12.5 ± 4.2</td>
<td>NA</td>
<td>176.4 ± 28.3</td>
<td>58.3 ± 13.9</td>
<td>NA</td>
</tr>
<tr>
<td>[51]</td>
<td>PS</td>
<td>189</td>
<td>MLS</td>
<td>Yes</td>
<td>NA</td>
<td>NA</td>
<td>150 (81-360)</td>
<td>100 (0-1,000)</td>
<td>NA</td>
</tr>
<tr>
<td>[52]</td>
<td>RS</td>
<td>34</td>
<td>NOTES</td>
<td>Yes</td>
<td>12.92 ± 2.2</td>
<td>NA</td>
<td>151.6 ± 25.93</td>
<td>200.2 ± 114.69</td>
<td>0</td>
</tr>
<tr>
<td>[51]</td>
<td>RS</td>
<td>889</td>
<td>MLS</td>
<td>Yes</td>
<td>12.27 ± 9.02</td>
<td>NA</td>
<td>201.6 ± 81.81</td>
<td>100</td>
<td>43 (4.84)</td>
</tr>
<tr>
<td>[63]</td>
<td>PS</td>
<td>30</td>
<td>MLS</td>
<td>Yes</td>
<td>16 (2-33)</td>
<td>NA</td>
<td>111 (74-165)</td>
<td>20 (5-400)</td>
<td>1 (3.3)</td>
</tr>
<tr>
<td>[66]</td>
<td>PS</td>
<td>125</td>
<td>MLS</td>
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<td>NA</td>
<td>Yes</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>[68]</td>
<td>PS</td>
<td>814</td>
<td>MLS</td>
<td>Yes</td>
<td>13 (8-18)</td>
<td>NA</td>
<td>180 (141-218)</td>
<td>100 (50-200)</td>
<td>NA</td>
</tr>
<tr>
<td>[73]</td>
<td>PS</td>
<td>71</td>
<td>MLS</td>
<td>Yes</td>
<td>18.7 ± 12</td>
<td>No</td>
<td>198 ± 48</td>
<td>110.1 (0-1,000)</td>
<td>NA</td>
</tr>
<tr>
<td>[75]</td>
<td>RS</td>
<td>254</td>
<td>MLS</td>
<td>Yes</td>
<td>12.0 ± 6.9</td>
<td>No</td>
<td>135.6 ± 40.0</td>
<td>101.5 ± 70.8</td>
<td>8 (3)</td>
</tr>
<tr>
<td>[82]</td>
<td>RS</td>
<td>113</td>
<td>MLS</td>
<td>Yes</td>
<td>20.3 ± 6.9</td>
<td>No</td>
<td>210.0 (100-420)</td>
<td>50.0 (0-1200)</td>
<td>NA</td>
</tr>
<tr>
<td>[83]</td>
<td>PS</td>
<td>169</td>
<td>MLS</td>
<td>Yes</td>
<td>7.05 ± 5.05</td>
<td>No</td>
<td>138.08 ± 23.79</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>

Abbreviations: Ref., reference; PS, prospective study; RS, retrospective study; MLS, multiport laparoscopic surgery; NOSE, natural orifice specimen extraction; NOTES, natural orifice transluminal endoscopic surgery; RH, right hemicolectomy; TME, total mesorectal excision; LH, left hemicolectomy; SC, sigmoid colectomy; LAR, low anterior resection; AR, Abdominoperineal resection; TC, total colectomy; LN, number of lymph node harvested; NeoA, neoadjuvant chemotherapy; OT, operation time. BL, estimated blood loss; C, conversion rate; NA, data not available.
surgery (NOTES), and totally laparoscopic surgery (TLS) for colorectal cancer. In our center, we had adopted MLS, SILS, and TLS.

Operative time and blood loss

Operative time varies significantly between the studies reflecting to type of performed laparoscopic surgery for colorectal cancer and accumulated experience/technical skills (Table 1). The estimated blood loss varies significantly from centre to centre and comprises around 10-1000 ml (Table 1). Major blood loss and need to blood transfusion in particular increase a risk of postoperative morbidity and mortality.

Conversion to open surgery

The conversion rate reported in the literature is in a range of 0-7.6% (Table 1). However, with surgical experience the conversion rate reduces and currently has no conversion to open surgery in expert centers in China. The main reason to conversion was bleeding. It is not appropriate to consider conversion from laparoscopic surgery to open surgery for colorectal cancer as a failure because patient’s safety and oncologic integrity of the procedure should be of supreme importance.

Mortality, morbidity and postoperative complications

Postoperative mortality rates following laparoscopic surgery for colorectal cancer vary between 0 to 11.8% (Table 2). Anastomotic stenosis, anastomotic bleeding, anastomotic leakage are the most feared complications in laparoscopic surgery for colorectal cancer. From the operative data, anastomotic stenosis rate ranged between 0 and 1.3%, anastomotic bleeding rate ranged between 0 and 7.8%, and anastomotic leakage rate ranged between 0 and 9.0% (Table 2). Laparoscopic surgery for colorectal cancer is associated with significant reduction in hospital stay. Postoperative hospital stay comprises 9.0 days in average (Table 2).

Outcomes

There are 26 studies reported the survival data of laparoscopic surgery for colorectal cancer in China [17, 19, 27, 35, 45, 48-51, 57, 63, 66, 68, 70, 73, 75, 79, 82, 83, 90, 95, 97, 107, 109, 125]. Sixteen studies reported the long-term overall survival of laparoscopic surgery for colorectal cancer [35, 45, 48, 50, 51, 57, 63, 66, 68, 73, 83, 95, 97, 107, 109, 125]. Ng KH, et al. reported the long-term survival of laparoscopic rectal cancer resection at a single institution with 579 cases over a 15-year period. They reported the overall 5- and 10-year survivals for rectal cancer were 70% and 45.5%, respectively and the cancer-specific 5- and 10-year survival was 76% and 56%, respectively [107].

Robotic surgery for colorectal cancer

Though laparoscopic surgery for colorectal cancer offers a number of patient benefits compared to open surgery, such as less invasiveness and pain, speedier recovery, better cosmetic results, milder morbidity, earlier time to walking, flatus, and oral intake, and quicker recovery with a shorter hospital stay, several limitations and disadvantages are associated with conventional laparoscopic surgery. An important reason for this is the steep learning curve of this technique. In addition, some other limitations that hinder the development of laparoscopic surgery include tremor, 2-dimensional vision, poor ergonomics, the need of a skilled assistant, and the limited degrees of freedom of the instruments. In an effort to minimize the difficulty of laparoscopy, a robotic surgery system was introduced in China in 2005 [114]. Robotic surgery is thought to be able to overcome these limitations by providing 3-dimensional vision, 7 degrees of freedom of the instruments, enhanced ergonomics, tremor filtration, and superior dexterity [42, 80]. These advantages of robotic surgery make it extremely suitable for pelvic dissection, especially for patients with a narrow pelvis and/or local advanced disease and especially important for complex procedures, such as the dissection of lymph nodes around major vessels because of its tremor filtration and superior dexterity.

Robotic surgery has many advantages over laparoscopic surgery, but some limitations in the current robotic technology still exist. When compared to conventional laparoscopic surgery, robotic surgery is associated with longer operation time, higher cost, and lacks tactile sensation and tensile feedback for the surgeon. Meanwhile, the limited data of the current work in China are preliminary and retrospective studies from single clinical center with
Table 2. Survey over major reports of laparoscopic surgery for colorectal cancer in China: Outcomes (Article in English)

<table>
<thead>
<tr>
<th>Ref.</th>
<th>Patient (n)</th>
<th>F</th>
<th>De</th>
<th>IC (n, %)</th>
<th>PC (n, %)</th>
<th>HS (d)</th>
<th>M n (%)</th>
<th>FP (m)</th>
<th>OSR (%)</th>
<th>DFSR (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>[16]</td>
<td>197</td>
<td>2.7 ± 0.8 in NOSE; 3.4 ± 0.9 in MLS</td>
<td>3.3 ± 0.6 in NOSE; 3.9 ± 1.1 in MLS</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>2 (3.1) in NOSE; 6 (4.5) in MLS</td>
<td>9.0 ± 1.9 in NOSE; 9.9 ± 2.0 in MLS</td>
<td>NA</td>
</tr>
<tr>
<td>[17]</td>
<td>119</td>
<td>2.7 ± 1.0</td>
<td>NA</td>
<td>NA</td>
<td>4 (3.4)</td>
<td>1 (0.8)</td>
<td>1 (0.8)</td>
<td>2 (1.7)</td>
<td>11.4 ± 4.7</td>
<td>1 (0.8)</td>
</tr>
<tr>
<td>[19]</td>
<td>80</td>
<td>2.34 ± 0.12</td>
<td>NA</td>
<td>NA</td>
<td>0</td>
<td>1 (1.3)</td>
<td>1 (1.3)</td>
<td>1 (1.3)</td>
<td>2 (2.5)</td>
<td>NA</td>
</tr>
<tr>
<td>[21]</td>
<td>289</td>
<td>3.1</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>9.2</td>
<td>NA</td>
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<tr>
<td>[24]</td>
<td>21</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
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<td>1 (1.3)</td>
<td>1 (1.3)</td>
<td>1 (1.3)</td>
<td>2 (2.5)</td>
<td>NA</td>
</tr>
<tr>
<td>[30]</td>
<td>70</td>
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<td>NA</td>
<td>NA</td>
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<td>NA</td>
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</tr>
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<td>[32]</td>
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<td>46.9 ± 14.8</td>
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<td>NA</td>
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<td>NA</td>
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<td>NA</td>
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<td>1 (3.1)</td>
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<tr>
<td>[45]</td>
<td>177</td>
<td>2.1 ± 0.7 (2-5)</td>
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<td>3 (1.69)</td>
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<td>NA</td>
<td>7 (3.95)</td>
<td>10.4 ± 2.7 (7-27)</td>
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<td>[48]</td>
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<td>NA</td>
<td>NA</td>
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<td>3 (0.8)</td>
<td>NA</td>
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<td>NA</td>
<td>NA</td>
<td>NA</td>
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<td>NA</td>
<td>NA</td>
<td>5 (2-63)</td>
<td>1 (0.5)</td>
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<td>34</td>
<td>2 ± 0.49</td>
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<td>8 (9.0)</td>
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<td>NA</td>
<td>0</td>
<td>7 (5-19)</td>
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<td>NA</td>
<td>NA</td>
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<td>NA</td>
<td>NA</td>
<td>1 (1.4)</td>
<td>10.4 ± 4.3</td>
</tr>
<tr>
<td>[68]</td>
<td>814</td>
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<td>NA</td>
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<td>32 (3.9)</td>
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<td>15 (1.8)</td>
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<td>1 (0.4)</td>
<td>5 (2.0)</td>
</tr>
<tr>
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<td>NA</td>
<td>NA</td>
<td>8 (8.1)</td>
<td>9.0 (7-52)</td>
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<td>[83]</td>
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<td>NA</td>
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<td>NA</td>
<td>0</td>
<td>NA</td>
<td>4 (2.4)</td>
<td>NA</td>
</tr>
</tbody>
</table>

Abbreviations: Ref., reference; LD, days to liquid diet; De, days to first defecation; F, days to first flatus; IC, intraoperative complications; PC, post-operative complications; MH, massive hemorrhage > 500 ml; OI, Organ injury; IL, ileus; IA, intestinal adhesion; AS, anastomotic stenosis; AB, anastomotic bleeding; AL, anastomotic leakage; HS, hospital stay (day); M, postoperative mortality; FP (m), follow-up period (month); OSR, overall survival rate (%); DFSR, Disease-free survival rate (%); NA, data not available.
small sample sizes. Multicenter, randomized, prospective trials are needed to compare the short-term and long-term outcomes of robotic surgery with those of conventional laparoscopic surgery.

In conclusion, there is no compelling reason to bar our interested Chinese gastrointestinal surgeons from performing laparoscopic surgery for colorectal cancer provided that they have received adequate training from major centers. The techniques spread are growing in China, as confirmed by the elevating number of recently published papers on this subject. However, only nine prospective randomized controlled trials have investigated the benefits of laparoscopic surgery for colorectal cancer in China. More randomized controlled clinical trials directly comparing the laparoscopic surgery and open approaches in China would be preferable and are extremely needed.

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Disclosure of conflict of interest

None.

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References

[14] Clinical Outcomes of Surgical Therapy Study Group. A comparison of laparoscopically as-
Laparoscopic surgery for colorectal cancer in China


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[84] Chen WT, Chang SC, Chiang HC, Lo WY, Jeng LB, Wu C, Ke TW. Single-incision laparoscopic


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