Int J Clin Exp Med 2015;8(2):2284-2288
www.ijcem.com /ISSN:1940-5901/IJCEM0004576

Original Article

Technique and surgical outcome of total resection of lower sacral tumor

Xiang Yin, Wei-Li Fan, Feng Liu, Jun Zhu, Peng Liu, Jian-Hua Zhao

Department of Spinal Surgery, Institute of Surgery Research, Daping Hospital, Third Military Medical University, Chongqing 400042, China

Received December 8, 2014; Accepted February 6, 2015; Epub February 15, 2015; Published February 28, 2015

Abstract: Objective: To summarize the technique and surgical outcome for total resection of lower sacral tumor. Methods: This retrospective study included 12 cases of total resection of lower sacral tumor (involving S3 and the below) from January 2010 to February 2013. Seven patients underwent en bloc resection and five cases accepted intralesional curettage. We used extraperitoneal approach to ligature the bilateral internal iliac artery, separated the tumor, and used transverse incision to separate the sacrum from surrounding ligaments and muscles. We then separated the sacrum to S2-S3 junction and ligatured the dural sac, cut off the sacrum at the S2-S3 junction, and remove the tumor out of the envelope. The other five patients underwent posterior surgery, which directly revealed lesions. Curettes were used under direct vision to scrape the tumor tissue. Results: All patients underwent the operation successfully without perioperative death or serious complication. The blood loss ranged from 300-650 mL (460 mL in average) in en bloc resection group. The blood loss ranged from 350-2800 mL (1595 mL in average) in curettage group. One case of transient enteroplegia and one case of transient gatism were respectively reported in en bloc resection group and one case of chronic pain in sacral was reported in curettage group. The postoperative pathological results revealed that there were 4 chordomas, 2 giant cell tumor and 1 metastatic tumor in en bloc resection group. All patients were followed up for 4-36 months (13.6 in average). At the final follow-up there was no recurrence reported. Two cases of local recurrence (40%) in curettage group were reported. Conclusion: The surgery combined with anterior-posterior approach helped remove the lower sacral tumor totally, with uncomplicated surgical operations and obviously reduced recurrence rate. The recurrence rate was significantly reduced using curettage method.

Keywords: Sacral tumor, sacrectomy, clinical outcome

Introduction

Sacral tumors are rare, accounting for 1%~4.3% of bone tumors [1]; sacral tumors lower than S3 are rarer, with occulting early growth and unobvious early clinical manifestations, and the tumor size is large when visiting, with severe clinical symptoms. At present, surgical resection is still the preferred method for sacral tumor treatment [2, 3]. But the surrounding anatomy of sacrum is complex, and the tumor size is large, with more complications, such as bleeding, wound infection, nerve injury and cerebrospinal fluid leakage [3]. Intralesional curettage costs less time, with less invasion and simple operations, but it is easy to relapse after surgery; en bloc resection causes larger surgical trauma, with high technical difficulty, but it can completely removal the tumor. 12 cases of patients with lower sacral tumor received surgical treatment in our department from January 2010 to February 2013, including seven cases of en bloc resection and five cases of intralesional curettage; now the comparative efficacy and technical methods of en bloc resection and intralesional curettage were summarized as follows:

Clinical data

General information

En bloc resection group included 7 patients, 5 males and 2 females, aged from 45 to 63 years old, with a mean age of 53.2 years old. Intralesional curettage group included 5 patients, 2 males and 3 females, aged from 43 to 58, with a mean age of 52.6 years old. Sacral pain

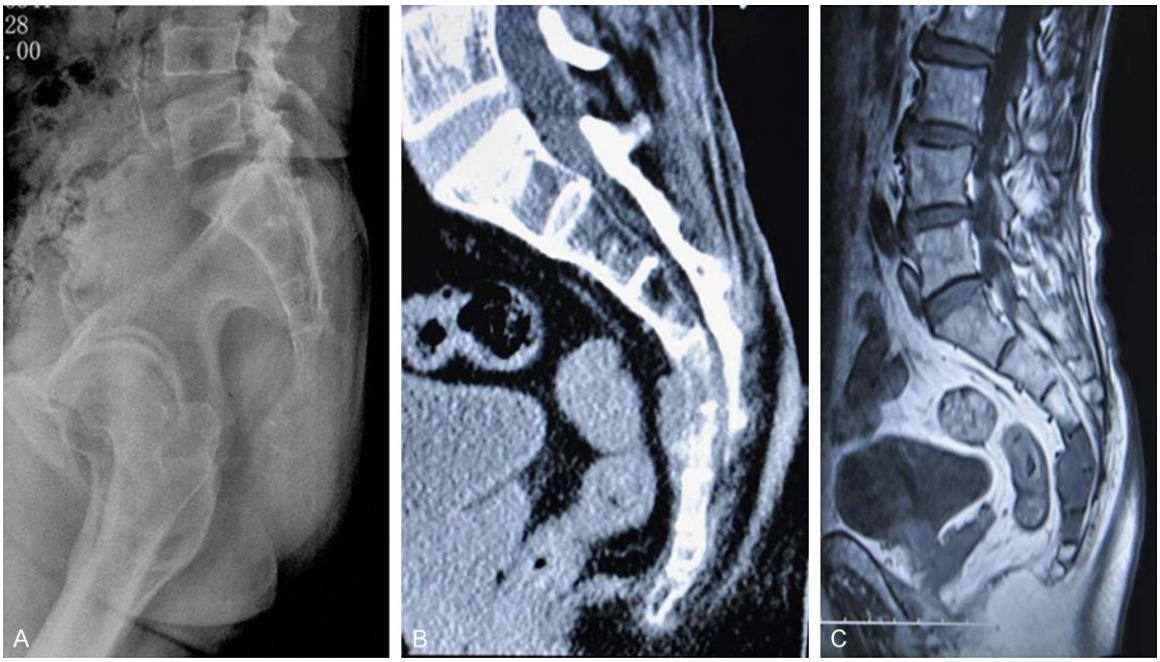

Figure 1. A. Indicated that sacrococcygeal bone destruction was found below S3. B and C. Showed the sacrococcygeal bone destruction was found below S3, and we can see mass around the soft tissue.

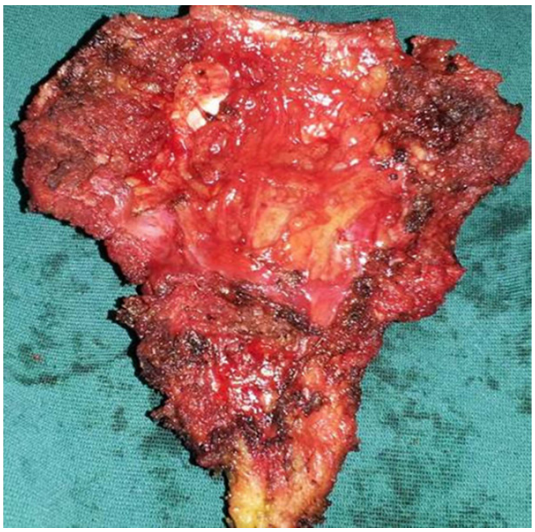

Figure 2. Indicated that en bloc removed sacrum and coccyx below S3.

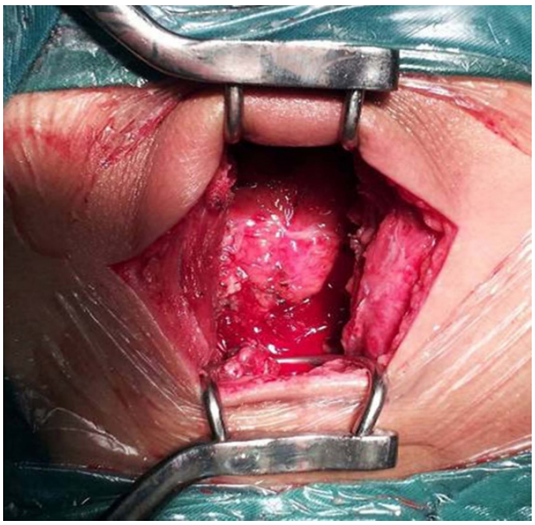

Figure 3. Showed that the posterior surgical field can directly see the rear wall of the rectum.

and progressive increasing mass were the generally diagnosed symptoms (n = 12), followed by the rest symptoms as: numbness in the saddle area (n = 6), sciatica (n = 5) and bowel and bladder dysfunction (n = 3). All patients underwent preoperative sacrococcyx lateral X-ray, enhanced CT and MRI (**Figure 1**); the average tumor size measured by CT and MRI was about 4.3 × 5.6 × 4.8 cm (1.7 × 4.4 × 3.2 cm ~ 7.3 × 7.7 × 6.4 cm). All lesions were involved in S3 vertebrae and the below. One patient received CT-guided biopsy in another hospital; the other patients accepted postoperative pathological examinations.

En bloc resection

All patients were treated with general anesthesia. With supine position, rectus abdominis incision was performed and bilateral internal iliac

Figure 4. A. Showed the three months after the operation, review of wound healing was good. B. Showed that after the sacral tumor resection, sacrococcygeal bone loss at S3 and its below.

artery were revealed and ligated through extraperitoneal approach; rectum sacral space was fully free, in order to separate the ventral tumors. large pieces of collagen sponge were placed between the ventral sacrococcyx and dorsal rectum; anterior incision was closed; with prone position, sacral transverse incision was made and deep fascia was cut; Erector was free and held up, revealing sacral dorsal; attachment points of the sacrum with surrounding ligaments and muscles were separated beginning from both sides and coccyx tips; a finger inserted into the separated sacrum-rectal space and touched the filling gelatin sponge; the rectum was pushed to the head to separate to S2-3 junction; after perspective confirmation, the bone resection behind S2-3 gap was preformed, revealing the dural sac for ligation; in 7 patients, five cases retained side of the S3 nerve root, and the rest two cases received complete resection of S3 nerve root. The sacrum was cut off since S2-3 gap with a bone knife; at this point you can remove the entire sacrococcygeal bone below S3 (**Figure 2**); in the surgical field, the rear wall of the rectum can be directly seen (**Figure 3**); hydrogen peroxide and diluted povidone-iodine were used to flush the incisions; Finally, they were immersed in a lot of distilled water; drainage tube was retained in the left cavity after the removal of sacrococcygeal bone; layer wound closure was conducted.

Intralesional curettage

Anesthesia was the same as former; only bilateral internal iliac artery ligation was performed in anterior surgery. Lesions were directly revealed in posterior surgery; sacral tumors were scraped as far as possible using a curette, and the remaining cavity was filled with gelatin sponge.

Postoperative treatment

Routine prevention of infection was given and the wound dressing change was strengthened. On the next day after surgery, patients were allowed to get out of bed; when drainage was less than 50 ml/day, drainage tubes were removed. Routine X-ray and CT were reviewed after surgery.

Results

All patients underwent the operation successfully without perioperative death or serious complications. The blood loss ranged from 300-650 mL (460 mL in average) in En bloc resection group. The blood loss ranged from 350-2800 mL (1595 mL in average) in curet-

tage group, which was significantly higher than that of en bloc resection group ($P < 0.01$). Wound healed well in all patients (**Figure 4**); one case of transient enteroplegia and one case of transient gatism were respectively reported in en bloc resection group; two cases of perianal skin hypoesthesia were discovered in patients with S3 nerve root resection. Sacral intralesional curettage group had one case of chronic pain in sacral. The postoperative pathological results revealed that: there were 4 chordomas, 2 giant cell tumor and 1 metastatic tumor in en bloc resection group; there were 2 chordomas, 2 giant cell tumor and 1 metastatic tumor in curettage group. All patients were followed up for 4-36 months (13.6 in average). Postoperative radiographic examinations showed complete removal of sacral tumors. At the final follow-up, daily lives and bowel and bladder function of all patients were normal; two cases of patients receiving S3 nerve root resection suffered from perianal skin sensory loss, but eased after surgery. There was no recurrence reported in En bloc resection group and there were intralesional 2 cases of recurrence in curettage group, with a recurrence rate of 40%, which was significantly higher than that of en bloc resection group, including one case of chordoma and one case of metastatic tumor respectively.

Discussion

Surgical resection is the preferred method for treatment of sacral tumor [2, 3]. But anatomy around sacral tumor was complex, and the operation was invasive. Surgical resection easily leads to bleeding and systemic inflammation. It had been reported that the amount of bleeding in sacral tumor resection was about 3000 mL [4]. It was likely to cause systemic inflammatory response and lead to multiple organ failure [5]. Therefore, how to control bleeding was the question that the surgeon must consider. In clinical, there were four kinds of methods: induced hypotension, bilateral internal iliac artery embolization, internal iliac artery ligation, and balloon occlusion of the abdominal aorta. The first two methods in controlling bleeding were not satisfied [6]. By temporary occlusion of the abdominal aorta, abdominal aortic were blocked by the expansion of balloon in order to achieve the purpose of bleeding control. The effect of bleeding control was more ideal, however, the position of the balloon, the length of time, and how to control blood pressure after balloon placement, and other related issues remained to be resolved, which were higher technical requirements for related ancillary departments and difficult to spread. Because when we did sacral tumor resection, tumor ventral were isolated through anterior incision. All the patients were treated with bilateral internal iliac artery ligation and the operation was simple. The results confirmed that two groups of patients had significantly reduced the loss amount of blood.

When conducting the lower sacral tumor resection, we made rectus abdominis incision to expose and ligate the bilateral internal iliac artery; after sufficiently freeing rectum-sacral space, the full separation of tumor ventral was performed, and chunks of gelatin sponge were placed between the backside of the sacrum and rectum as safety signs for the posterior approach. Packing gauze should be avoided; otherwise the gauze taking would be very passive when subsequent surgery cannot be performed caused by disease progression. When freeing rectum-sacral space, presacral venous plexus should be fully protected; if accidentally damaging, temporary occlusion of the abdominal aorta should be performed for bleeding treatment [4]. We took posterior transverse incision to expose sacral tumors, in order to obtain a more adequate surgical field, and it was more ease to separate the sacrum from the tip of the coccyx and from both sides, because here were all ligament structures, including sacral junction ligament, sacrospinous ligament, sacroiliac dorsal ligament and sacroiliac ventral ligament, so as to achieve complete resection of the primary tumor. Sacroiliac joint is mainly composed of the iliac and sacral 1-2; the sacral 3 and below sacrum are called lower sacrum; complete resection of S1-2 needs complete amputation of the sacroiliac joint and thorough reconstruction of the spine-pelvic connection; the surgery is difficult and is difficult to spread; while total resection of lower sacral tumors did not affect the spine-pelvis stability, without spine-pelvic reconstruction; the surgery is relatively easy and can be widely carried out.

How to deal with sacral nerve was an unavoidable issue during sacral tumor resection. There

was a contradiction on complete resection of the tumor and retention of neurological function. We believed that the low sacral tumor resection, at least one side of the S3 nerve root should be retained, and preserved postoperative sphincter function. Even if the tumor recurrence, at least in the very long lifetime, the quality of life can be assured for patients [7, 8]. Daily life and the function of bowel and bladder were normal during the follow-up of all patients in this study. The recurrence rate varied in different histological type of sacral tumor. Fundamental measure to reduce the recurrence rate was the complete removal of the tumor. In this study, there was no recurrence during the follow-up of 7 patients who underwent en bloc resection of implementation. The five cases using intralesional curettage of the patients had two cases of recurrence. One patient was in chordoma, and one case of metastases. The main reason for relapse curettage was more bleeding during tumor resection. Therefore we could not completely scrape tumor, and there was the possibility of the presence of metastasis. For the lower sacral tumor, we believed that en bloc should be adopted. In the removal process, the cut should be reached to "surgical edge" sufficiently. In order to prevent metastasis, we should reduce the tumor pressing and isolate the tumor from its surrounded wounds and soft tissue. After resection of the tumor, distilled water and a great many of effective chemotherapy drugs should be used for immersion, and the soaking time should be sufficient.

In conclusion, en bloc excision was optimal treatment of low sacral tumor. Resection of the tumor by combination of anterior and posterior had reduced the difficulty of operation. Surgical technique was not complex. The retention of one side S3 nerve root can improve the quality of life for patients.

Disclosure of conflict of interest

None.

Address correspondence to: Dr. Peng Liu or Jian-Hua Zhao, Department of Spinal Surgery, Institute of Surgery Research, Daping Hospital, Third Military Medical University, Chongqing 400042, China. E-mail: liupeng3d@163.com (PL); zhaojianhua64@126.com (JHZ)

References

[1] Chandawarkar RY. Sacrococcygeal chordoma: review of 50 consecutive patients. World J Surg 1996; 20: 717-719.

[2] Bergh P, Kindblom LG, Gunterberg B, Remotti F, Ryd W, Meis-Kindblom JM. Prognostic factors in chordoma of the sacrum and mobile spine: a study of 39 patients. Cancer 2000; 88: 2122-2134.

[3] Fourney DR, Rhines LD, Hentschel SJ, Skibber JM, Wolinsky JP, Weber KL, Suki D, Gallia GL, Garonzik I, Gokaslan ZL. En bloc resection of primary sacral tumors: classification of surgical approaches and outcome. J Neurosurg Spine 2005; 3: 111-122.

[4] Tang X, Guo W, Yang R, Tang S, Ji T. Risk factors for blood loss during sacral tumor resection. Clin Orthop Relat Res 2009; 467: 1599-604.

[5] Brown MJ, Kor DJ, Curry TB, Warner MA, Rodrigues ES, Rose SH, Dekutoski MB, Moriarty JP, Long KH, Rose PS. Sacral tumor resection: The effect of surgical staging on patient outcomes, resource management, and hospital cost. Spine 2011; 36: 1570-1578.

[6] Guo W, Xu WP, Yang RL, Tang XD. The surgical management of sacral tumors. Zhonghua Wai Ke Za Zhi 2003; 41: 827-31.

[7] Hulen CA, Temple HT, Fox WP, Sama AA, Green BA, Eismont FJ. Oncologic and functional outcome following sacrectomy for sacral chordoma. J Bone Joint Surg Am 2006; 88: 1532-1539.

[8] McPherson CM, Suki D, McCutcheon IE, Gokaslan ZL, Rhines LD, Mendel E. Metastatic disease from spinal chordoma: a 10-year experience. J Neuro Surg Spine 2006; 5: 277-280.