Preoperative Embolization of Sacral Tumors: Embolization of the Middle Sacral Artery

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Purpose

Surgical management is considered to be an effective therapy in patients with sacral tumors causing pain or neurological deficit, can maintain pelvic stability and relieve or prevent compression of the nerve roots. Preoperative embolization of bilateral internal iliac artery has been introduced into primary and metastatic sacral tumors surgery to reduce extensive hemorrhage and facilitate surgical resection. However, the value of embolization of the middle sacral artery, which is an important feeding artery of the sacral tumors, has not yet reached a clear conclusion. The purpose of this retrospective study was to evaluate the effect of embolization of the middle sacral artery on intraoperative blood loss.

Methods and Materials

The details of a total of 63 patients with sacral tumors were retrospectively analyzed in the current study. They had received preoperative embolization that was followed by surgical resection of the sacral tumor. The patients were treated in our hospital from March 2003 to July 2012. Their pathological results were also available. Of the subjects, 49 suffered from primary tumors and 14 suffered from metastatic tumors.

Embolization was performed under local anesthesia. First, the femoral artery was punctured and then a catheter was introduced for tumor angiography with digital subtraction angiography (DSA). Next, microcatheters were super-selectively inserted into the tumor feeding arteries and the embolization agent was injected into these arteries via the microcatheter under continuous fluoroscopic examination. Embolization agents included gelatin sponge particles (diameter of 350 to 560 um) and strips, pyramid micro coils and common coils. In 37 cases of them, the embolization of the middle sacral artery with gelatin sponge particles (diameter of 350 to 560 um) were performed.

Within 5 days of embolization, the neoplasm was resected under general anesthesia by the bone oncology specialist. Blood loss during surgery was estimated and recorded. All cases were divided into the primary tumor group and metastatic tumor group. The t test or non-parametric test analysis was used to evaluate the effect of middle sacral artery embolization on intraoperative blood loss. P<0.05 was considered statistically different.

Results
For all 63 subjects, the mean intraoperative blood loss was 1833 ml with middle sacral artery embolization and 2353 ml without middle sacral artery embolization \((P=0.139)\). It was not statistically different. For metastatic tumor group \((n=14)\), the mean intraoperative blood loss was 2545 ml with middle sacral artery embolization and 2312 ml without \((P=0.821)\). But embolization of the middle sacral artery were associated with decreased intraoperative blood loss relative to without embolization in primary tumor group \((1570\text{ml vs 2361ml, } P=0.044,n=49)\). (Table)

**Images for this section:**

<table>
<thead>
<tr>
<th>Table: Summary of Patient Data</th>
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<tr>
<td><strong>Group</strong></td>
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<td>All</td>
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<td>Embolization</td>
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<td>Without embolization</td>
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<td>Metastatic tumor</td>
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<td>Primary tumor</td>
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<td>Embolization</td>
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<td>Without embolization</td>
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**Table 1**

**IBL=Intraoperative Blood Loss**
Conclusion

Embryologically, the middle sacral artery is a continuation of the abdominal aorta. It arises from the posterior aspect of the aorta a little above its bifurcation. It descends to the surface of the last lumbar vertebra and along the frontal midline of the sacrum to the upper part of the coccyx. At the level of the fifth lumbar vertebra, it often gives off a small lumbar artery (arteria lumbalis ima), which anastomoses with the fourth lumbar arteries. At the sacral level, it anastomoses with the lateral sacral arteries. The terminal branches of the middle sacral artery called the coccygeal body. The middle sacral artery anastomoses with lumbar arteries, lateral sacral arteries, iliolumbar arteries and small branches pass through the mesorectum to supply the posterior surface of the rectum [6] [Fig 1]. With all the anastomoses, the median sacral artery forms a network of sacral peripheral arterial anastomoses. Therefore, in the preoperative embolization of sacral tumor, with the embolization of bilateral internal iliac arteries and fourth lumbar arteries, the middle sacral artery embolization, not only embolize of the direct feeding artery of sacral tumors, but also block the indirect supplying channel of sacral tumors [Fig 2]. If without middle sacral artery embolization, the anastomoses of the sacral region from the middle sacral artery will open, and intraoperative blood loss will increase. With the middle sacral artery embolization, preoperative embolization of sacral tumors can significantly reduce intraoperative bleeding for primary sacral tumors. Preoperative embolization of the middle sacral artery is necessary for primary sacral tumors.

Images for this section:
Fig. 1: This 26-year-old man had an Ewing's sarcoma of the sacrum. The middle sacral arteriogram reveals the anastomoses of the middle sacral artery (solid arrows): both fourth lumbar arteries (white arrows) and the lateral sacral arteries (fine arrows).
Fig. 2: Neurofibroma of the sacrum in a 40-year-old man. The middle sacral arteriography reveals extensive tumor vascularity (white cross) supplied by a large middle sacral artery (open arrow). The arteria lumbalis ima(solid arrows) arise from the middle sacral artery.
References


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