

# Hemicorporectomy: A Case Report

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## Abstract

A case report of two successful cases who underwent hemicorporectomy, previously known as translumbar amputation. The first patient was diagnosed high grade osteosarcoma at sacrum. The other was recurrent giant cell tumor at left proximal femur.

**Keywords:** hemicorporectomy, translumbar amputation

**H**emicorporectomy (also known as translumbar amputation, halfectomy) is an operation of amputation of the pelvis and lower extremities by disarticulation through the lumbar spine, as well as creation of conduits for diversion of urinary and fecal tracts.<sup>1</sup>

Originally, hemicorporectomy was performed in cases with locally aggressive cancers confined to the pelvis. However, it was also claimed to be beneficial in patients with severe trauma to the pelvis and lower extremities,<sup>2</sup> vascular malformations, acute aortic occlusion, recurrent perianal and scrotal fistulas and terminal pelvic osteomyelitis (this term represents pelvic osteomyelitis with chronic decubitus ulcers which is refractory to treatment with antibiotics and standard surgical treatments).<sup>1,3,4</sup>

Hemicorporectomy is not a common operation due to its invasive procedure. However, it can be a life-saving operation with good co-operation among the multi-disciplinary team.

The life-threatening intra-operative complication was hypotension, while post-operative wound complications were experienced by all cases. The term 'wound complications' refers to superficial wound dehiscence, delayed wound healing, and osteomyelitis of distal lumbar spine. Genitourinary complications (including recurrent urinary tract infection, pyelonephritis, renal calculi and urosepsis) are also found in many cases.<sup>1</sup>

This case report illustrates two cases of patients suffering from malignancy in pelvis and lower extremities. The first case was diagnosed high grade osteosarcoma at sacrum, while the other was recurrent giant cell tumor at left proximal femur.

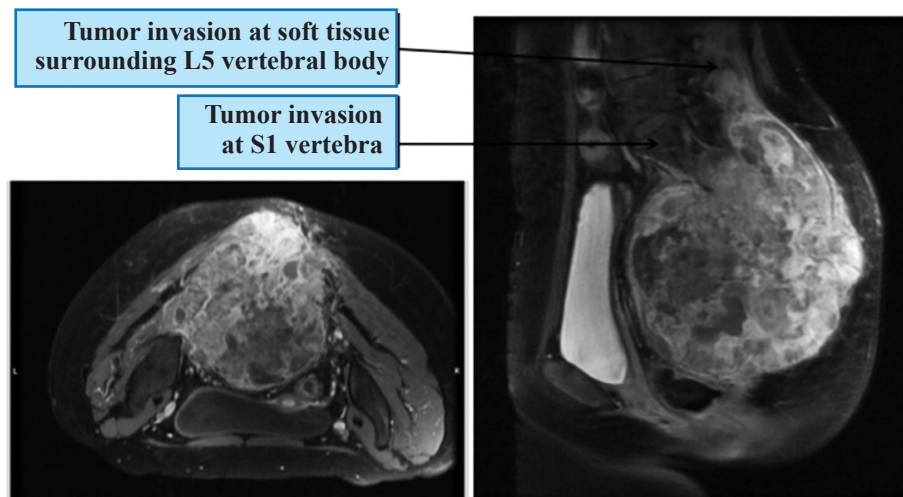
## Case report

Two cases are described in this study. The first case is an 18-year-old female with high grade osteosarcoma at sacrum presented with chronic pelvic pain unalleviated by analgesic drugs. Pathologic examination showed high grade osteosarcoma stage IIB at sacrum. After receiving neoadjuvant chemotherapy, the tumor was not decreased in size and still did not present metastasis. MRI revealed that the tumor had invaded the entire sacrum and all sacral nerve roots with severe soft tissue extension and bony margin surrounding the 5<sup>th</sup> lumbar vertebra, shown in Figure 1.

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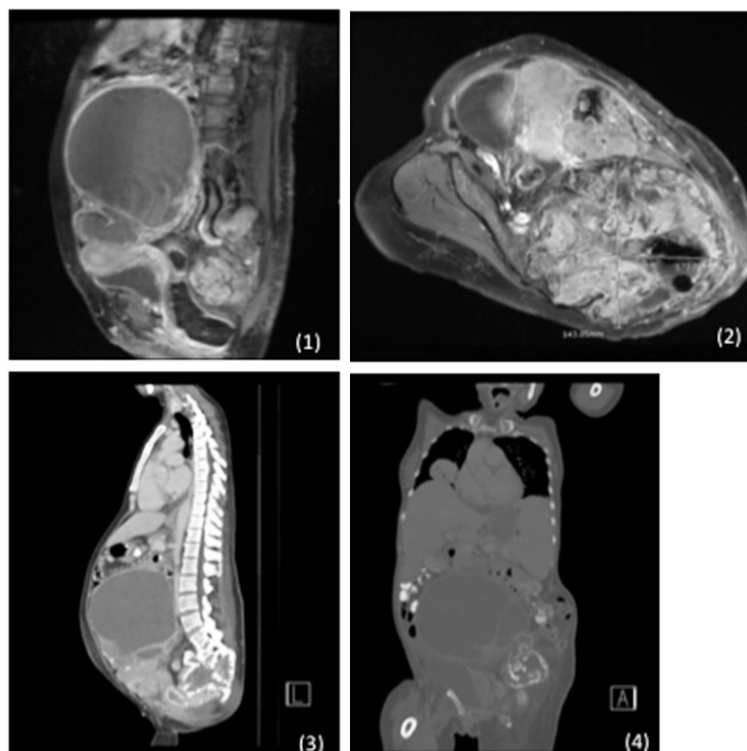
**Figure 1 :** The pelvis MRI demonstrates the invasion of the tumor of the entire sacrum and all sacral nerve roots with severe soft tissue extension, bony margin involving the 5<sup>th</sup> lumbar vertebra.

Indications for surgery in this patient were:

1. An extensive tumor which required massive soft tissue reconstruction.
2. Bone reconstruction might not be able to maintain her ambulatory ability in an upright and standing position because of the massive removal, furthermore the lumbosacral nerve plexus could also be injured from the operation.
3. Post-operative complication would be prolonged adjuvant chemotherapy if hemipelvectomy were not performed.
4. Tumor extraction might be impossible due to huge size in its coronal dimension.

5. Intraoperative bleeding control might be unobtainable.
6. Disease was still not systematically metastasis and curative disease was still expected.

The second case is a 51-year-old female with recurrent giant cell tumor at left proximal femur with lung metastasis. She was previously diagnosed with giant cell tumor at left sacrum and ilium once, then underwent internal hemipelvectomy in 2009, but the disease recurred. She came to the hospital with progressive peritonitis. The MRI in June, 2017 showed an extensive recurrent tumor in sacrum and left extraperitoneal pelvis with extensive intra-abdominal, shown in Figure 2.



**Figure 2 :** The MRI illustrates an extensive recurrent tumor in sacrum and left extraperitoneal pelvis with extensive intra-abdominal.

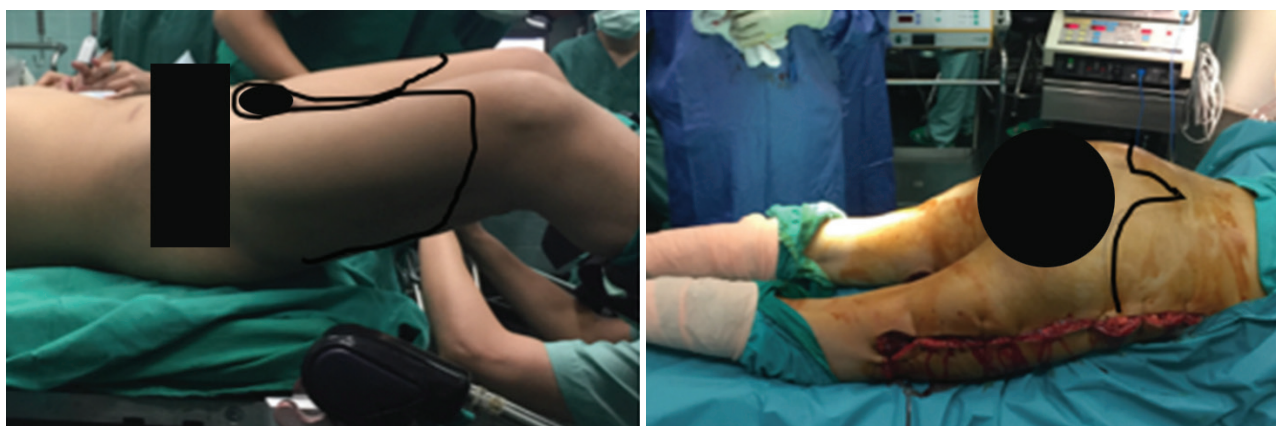
Indications for surgery in this patient were:

1. Acute peritonitis with uncontrolled infection.
2. Inadequate soft tissue coverage after simple external hemipelvectomy.
3. Benign bone tumor with chance of long term survival.

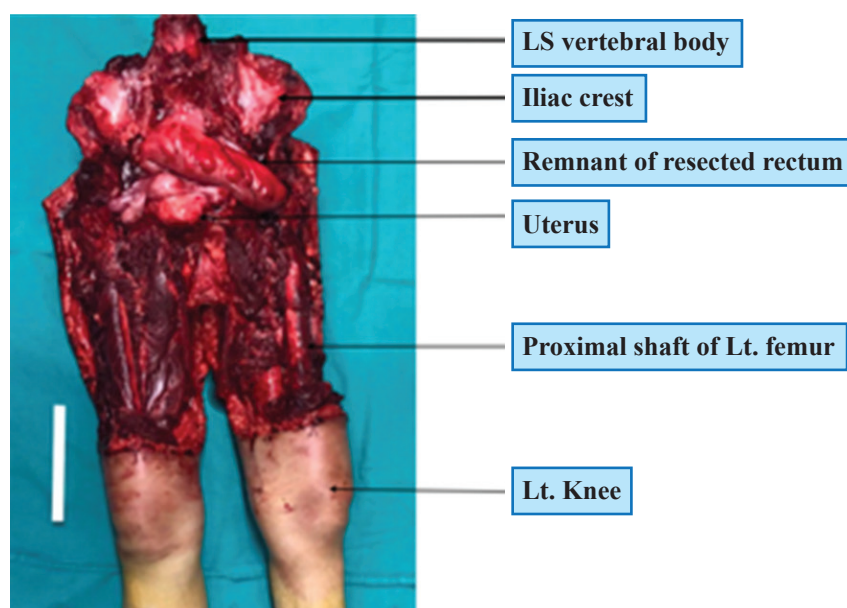
### Operation procedures

On March, 2017, hemicorporectomy at level of L5-S1 was performed with agreement and consent of patient and her family. Multidisciplinary team including colorectal, urologic, vascular surgeons, ICU care team, endocrinologist, psychiatrists, and rehabilitation co-operated to prepare steps of operation and post-operative care. Patient was laid in supine position. The operation started with ligation of IVC and bilateral internal iliac a. Ureterostomy and colostomy was done respectively. Abdomen was temporarily closed for further operations.

Anterior discectomy was performed first with intra-operative fluoroscopy to check the accurate level of lumbar spine needed to be cut. Orthopedic surgeon then dissected anterior femoral thigh flap and ligated, shown in Figure 3. Patient was changed into prone position. Curve incision with vertical line incision was done at the level of L5. Laminectomy was done at L4-L5 with intra-operative fluoroscopy to check the accurate level. Vertebral body of L4 and L5 were cut at their intervertebral disc. Paravertebral muscles and psoas muscle were cut and extracted lower extremities from the proximal part, distal part of body shown in Figure 4. Bleeding was checked and ligation was done before the stump was finally covered with flap. The whole operation lasted 16 hours and total blood loss was 5,200 ml. Patient was supine again and maturity colostomy was done.



**Figure 3 :** Illustrates the flap incision from anterior and posterior view respectively.



**Figure 4 :** Shows the dissected lower extremity with remnant of resected rectum as labelled.



During operation, blood loss was accurately calculated and replaced. Overtransfusion can lead to pulmonary edema easily, since the total blood volume reduced dramatically by nearly one-half.

For post-operative care, patient was awake and able to extubate one day post operation. She also showed signs of adjustment disorder with anxious mood. Psycho-supportive and hormonal replacement was provided (estrogen level dropped secondary to bilateral salpingectomy.) The patient felt more comfortable afterwards. However, this patient developed surgical site infection with evidence of *Enterobacter faecium*, positive from pus culture. She was then given wound debridement with intravenous vancomycin and the infection subsided.

After the patient was infection-free and pain was tolerated, rehabilitation was the next step in this patient. Upper-limb strength-training exercises are **required to provide adequate power for transfer and locomotion**. Sitting upright started in a semirecumbent position then sequentially increased the

position. Active range of motion exercise of upper extremities, breathing exercise with incentive breathing spirometer (Triflow) and muscle strengthening exercises were provided as tolerated. Seat cushion from cut-out foam was also applied instead of using total contact orthosis.

With aid from the rehabilitation department, a translumbar socket was applied on 31 July 2017. No pressure sore was detected. The translumbar socket allowed her to move from supine to sit and transfer to wheelchair independently. The socket was designed to have 'mail slots' for the colostomy and ureterostomy, shown in Figure 5. The platform was also platform-extended to increase the stability. The socket was tailor-made. There was also an addition of a rocker bottom at the distal platform to allow smoother forward progression by using arms for a swing-through gait.

She can now change her own ureterostomy and colostomy by herself with a little assistance of her caregiver. She is independent of her self-care and was trained in basic wheelchair skills. She developed a fair sitting balance.



**Figure 5 :** Shows the translumbar socket with 'mail slots' for the colostomy and ureterostomy. With this socket, this patient developed a fair sitting balance.

The second case was performed in June 2017, the patient underwent hemicorporectomy at lumbar vertebrae 4 and 5 with the usage of right anterior thigh flap. The steps were quite similar to the first case. The difference was that it started with tumor suction in the intra-abdominal area first and then the colostomy was created. Hemicorporectomy at level L4-5 was then performed and the stump was covered with right anterior flap. The duration of the entire operation was 14 hours, which was shorter than the first case and the total intra-operative blood loss was 8,000 ml.

For post-operative care, the patient was provided with a similar rehabilitation program to the first case, including upper limb strengthening and breathing exercises. The patient developed wound dehiscence and wound infection postoperatively, which are common complications after hemicorporectomy. After multiple debridement and intravenous antibiotics, the infection subsided.

### Discussion

Hemicorporectomy is a major operation that refers to an amputation of pelvis and lower extremities with construction of ureterostomy and colostomy. These two cases were patients who suffered from bone and soft tissue tumors.

A review of literature shows that the steps of operation have not changed significantly since 1960. The first case in the world introduced the single stage anterior-to posterior approach, where direct closure of the lower abdominal wound was performed in a fish-mouth fashion.<sup>1,3,5</sup> An early breakdown of this tension resulted in exposure of the spinal canal, which led to meningitis and further cerebral empyema.<sup>1</sup> The standard method is the two-stage anterior-to-posterior approach. Musculocutaneous subtotal thigh flap, based on the superficial femoral vessels was used to provide a tension-free closure and ample cushioning for the amputated lumbar spine.<sup>1</sup> However, there was a study from the southwestern surgical congress in 2008 that introduced another approach: the posterior-to-anterior approach. This involved early division of the vertebral structures and spinal cord, pre-empting engorgement of Batson's plexus, which was purported to minimize blood loss and improve exposure of pelvic vessels.<sup>6</sup>

In our practice, we performed the standard method; **two stage anterior-to-posterior approach** with the usage of thigh flap. The step of operation starts with ligation of main vessel, creating the ureterostomy and colostomy and disarticulation the lumbar spine.

The total blood loss was 5,200 ml and 8,000 ml for the first and second case respectively. There was neither post-operative meningitis nor cerebral empyema. Even though the second

case was more complicated, the operation did take less time (16 and 14 hours respectively) due to the surgeons' experience and well-prepared planning.

During the operation, blood loss was accurately calculated and replaced. Overtransfusion can lead to pulmonary edema easily, since the total blood volume reduced dramatically. This can be prevented by monitoring the central venous pressure closely. If it begins to surge, rate of transfusion should be reduced. The post-operative amount of intravenous crystalloid/colloid given to patient was also calculated with half of the pre-operative body weight. Urine output, central venous pressure, blood pressure, hematocrit were all used as parameters to detect adequacy of circulating blood volume.<sup>7</sup>

For post-operative care, both of the cases developed **wound dehiscence and wound infection** that responded to adequate debridement and intravenous antibiotics. They both also had recurrent urinary tract infections due to loss of sphincter. These patients also had a risk of **depression and adjustment disorder** due to major operation and intolerable pain. A psychiatrist should assess the patient before and after the operation. **Nutritional maintenance** is also a critical factor. The majority of patients are not achieving the nutritional goal until about 3 to 4 weeks postoperatively due to decreased intake and increased metabolic demands. Intravenous alimentation should be started preoperatively and carried through to the postoperative period.

Furthermore, body surface area loss by half affects heat evaporation and temperature regulation, causing these patients to have difficulty in **regulation of body temperature**.<sup>1</sup>

Another point need to be concerned with is **rehabilitation**. For the best quality of life after the operation, we should promote upper limb strengthening training, not only post-operatively, but should start right at the moment we decide to perform a hemicorporectomy. The sooner the training begins, the more powerful the upper limbs become. Therefore patients with good upper limb muscle power tend to have better recovery post-operatively. The ROM exercise, breathing exercise, sitting balance and wheelchair training are also crucial for every patient.

### Conclusion

Hemicorporectomy is an operation of disarticulation of pelvis and lower extremities. It is an undeniably a major operation, but not a harmful one. With a well-organized multidisciplinary team and good comprehension of operation steps, hemicorporectomy can be performed safely as a life-saving operation.

## Summery

	First case	Second case
Age (years)	18	51
Disease	- High grade osteosarcoma at sacrum	- Recurrent giant cell tumor at Lt. proximal femur
Previous treatment	- Sacrectomy and wide resection mass at buttock - Adjuvant chemotherapy (Adriamycin and cisplatin x 4 doses)	- Internal hemipelvectomy
Surgery team involved	- Orthopedic surgeons, lower gastrointestinal surgeons, urosurgeons, vascular surgeons.	- Orthopedic surgeons, lower gastrointestinal surgeons, urosurgeons, vascular surgeons.
Technique of operation	- Two-stage anterior-to-posterior technique	- Two-stage anterior-to-posterior technique
Steps of operation	- Clamping aorta → Ureterostomy → Colostomy → Laminectomy → Flap coverage	- Clamping aorta → Intra-abdominal Tumor suction → Colostomy → Ureterostomy → Laminectomy → Flap coverage
Duration of whole operation	16 hours	14 hours
Total blood loss	5200 ml	8000 ml
Post-op complications	- Superficial wound complication (infected surgical site) - Recurrent urinary tract infection - Adjustment disorder	- Superficial wound complication (dehiscence, flap infection) - Recurrent urinary tract infection - Bone pain → <a href="#">start IV Zoledronic acid</a> monthly
Creatinine excretion (reflection of muscle metabolism)	0.26	0.30
Rehabilitation & Ambulation	- Deep breathing exercise - ROM exercise - Upper limb strengthening exercise - Bed mobility training - Transfer training - Sitting in wheelchair - Self-care activity training - Toilet training (changing equipment) - Assistive devices (translumbal socket with 'mail slots') - Wheelchair training with upper limbs	- Deep breathing exercise - ROM exercise - Upper limb strengthening exercise - Bed mobility training - Transfer training

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