

## THE SURGICAL TECHNIQUE FOR HINDQUARTER AMPUTATION

### *A Report of 19 Cases*

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The surgical technique for hindquarter amputation is described in a step-by-step manner. Since 1955 we have performed 19 such operations for eradication of malignant bone and soft tissue tumors in the pelvic, hip and upper thigh regions. Three hindquarter amputations were performed for local recurrence following initial wide excision. The overall 5-year survival rate for our 19 patients was 42.1 per cent. Malignant soft tissue tumors appear to have a much better 5-year survival rate than malignant bone tumors (60 per cent vs. 22.2 per cent). We feel that surgery is still the treatment of choice. However, in the presence of proper indications, chemotherapy and radiotherapy should be added to surgery in order to prolong survival time and save lives.

*Key words:* hindquarter amputation; hemipelvectomy

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Hindquarter amputation is synonymous with hemipelvectomy, disarticulation of the innominate bone, interilio-abdominal amputation, sacroiliac disarticulation, transiliac amputation, interpelviabdominal amputation and transpelvic amputation. Its surgical technique was popularized by Gordon-Taylor and his associates (Gordon-Taylor & Wiles 1935, Gordon-Taylor 1940) and was subsequently modified by King & Steelquist (1943), Sorondo & Ferre (1948), and Banks & Coleman (1956). Due to the extremely mutilating nature of this operation, its primary usage is for eradication of malignant primary soft tissue and bone tumors of the pelvis, hip and upper thigh regions (Gordon-Taylor & Wiles 1935, Gordon-Taylor 1940, Pack & Ehrlich 1946, Pack et al. 1947, Beck & Bickel 1948, Sugar-

baker & Acherman 1949, Wise 1949, Lee & Alt 1953, Pack 1956, Bailey & Steven 1961, Pack & Miller 1964, Phelan et al. 1964 and Marcove et al. 1972).

In addition, occasionally, hindquarter amputation has been employed in the treatment of severe trauma (McPherson 1960, McLean 1962, Wade & Macksood 1965 and Johansson & Olerud 1971), metastases (Gordon-Taylor et al. 1952, Bailey & Steven 1961 and Pack & Miller 1964), and infection (Alldred & Nisbet 1964).

### MATERIAL

From 1955 to 1975, 331,471 in-patient operations were performed at Henry Ford Hospital. However, only 19 hindquarter amputations were done during the same period. This means that hindquarter amputation represented only one

per approximately 17,000 operations or, in terms of time, one per year.

The indications for our 19 hindquarter amputations are summarized in Table 1.

Table 1.

Disease	Number of patients
<b>Malignant primary bone tumors</b>	
Osteogenic sarcoma	4
Chondrosarcoma	4
Ewing's sarcoma	1
<b>Malignant soft tissue tumors</b>	
Rhabdomyosarcoma	4
Fibrosarcoma	3
Mesenchymoma	2
Extrasosseous osteogenic sarcoma	1

There were 11 males and 8 females. Sixteen of them were white and three black. Their age distribution is shown in Table 2.

Table 2.

Decade	Number of patients
0-9	0
10-19	4
20-29	2
30-39	3
40-49	2
50-59	2
60-69	6

**METHODS**

Primary treatments in our 19 patients are listed in Table 3.

Table 3.

Primary treatment	Hindquarter amputation	Wide local resection	Radiotherapy plus hindquarter amputation
Number of patients	15	3	1

With the exception of the one case of Ewing's sarcoma, radiotherapy and chemotherapy were

reserved for recurrence of tumors and metastases. Only one patient underwent pulmonary lobectomy for metastases, and he died 1½ years postoperatively from widespread metastases. No prophylactic chemotherapy was used in this series.

**SURGICAL TECHNIQUE**

Prior to the amputation, insertion of a Foley catheter, suturing of the anus and administration of prophylactic intravenous antibiotic are routinely carried out. The patient is placed in a lateral position and the affected leg is held in 45° of abduction.

The amputation is performed in five steps.

1. Step one, the skin incision (Figure 1), begins from the superior aspect of the sacroiliac joint, going along the iliac crest to the anterior superior iliac spine and then following the inguinal ligament to the pubic tubercle where the line becomes bifurcated; one to the pubic

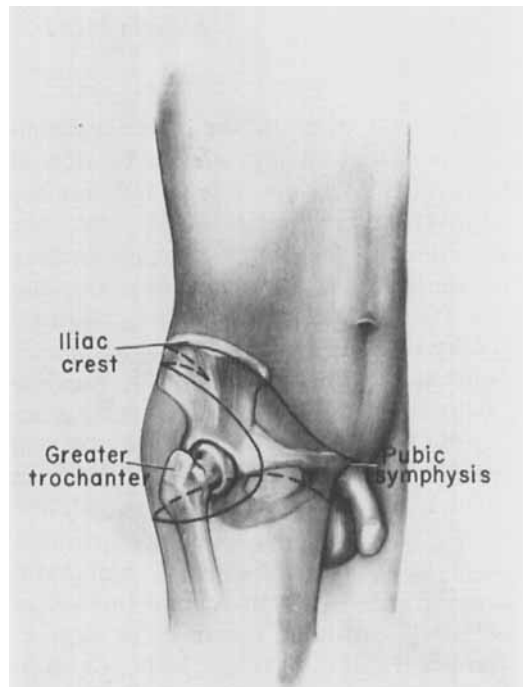


Figure 1. The skin incision.

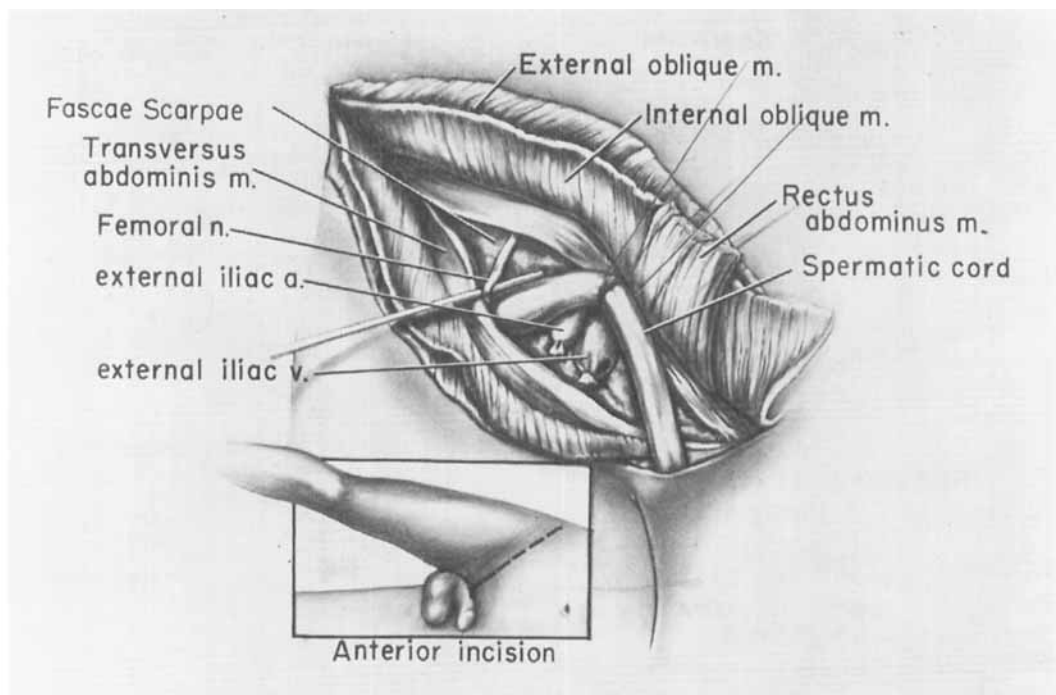


Figure 2. The anterior incision and resection.

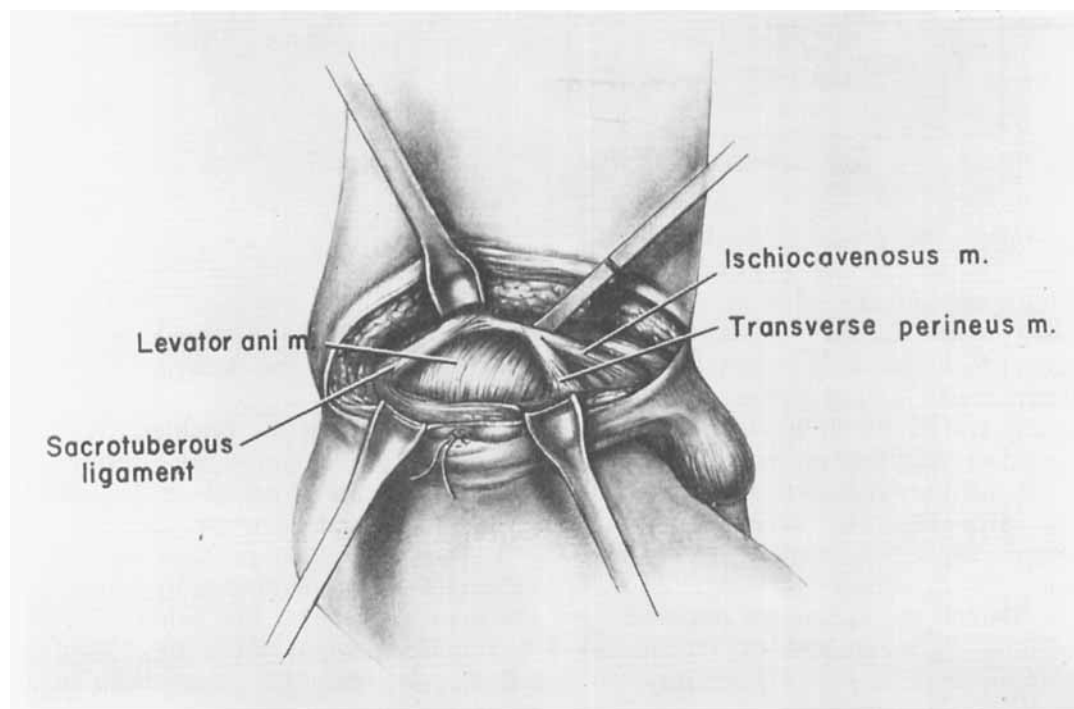


Figure 3. The perineal resection.

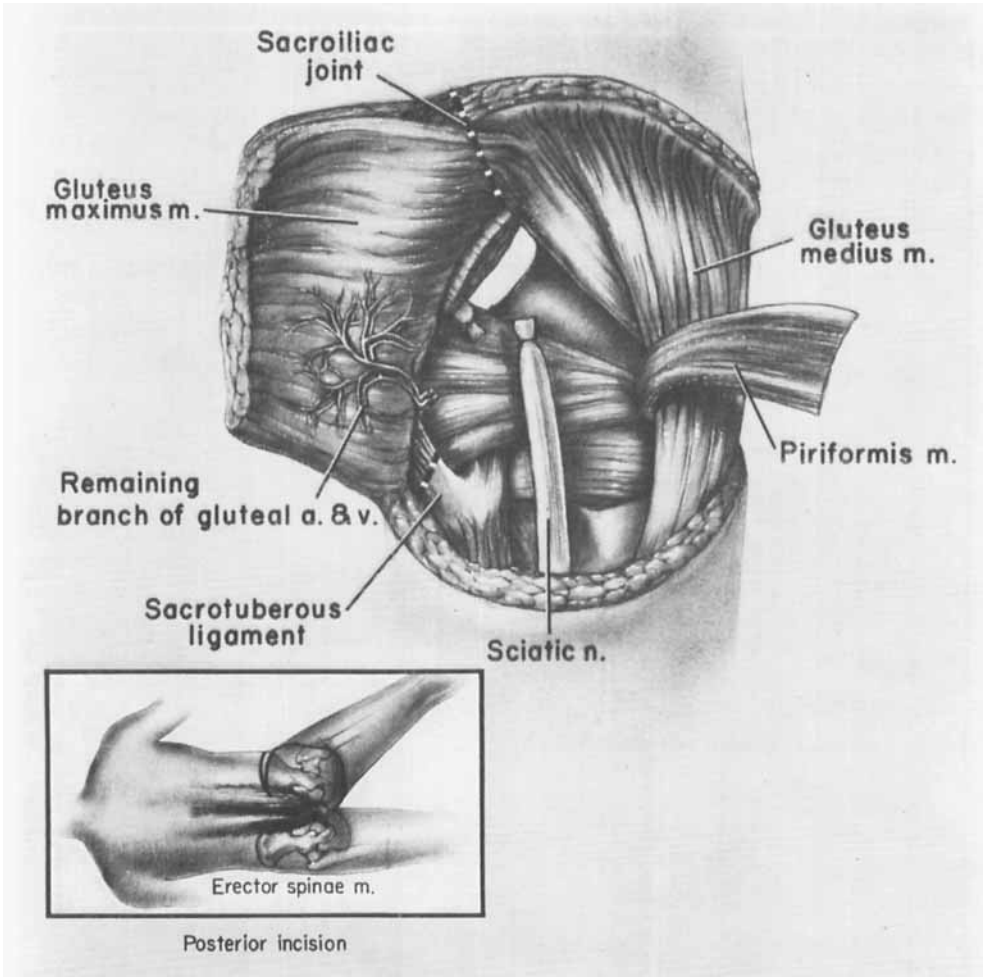


Figure 4. The posterior resection.

symphysis, and the other along the perineal crease to the beginning of the gluteal fold. The incision then travels the entire length of the gluteal fold to the greater trochanter from which the line is curved upward and medialward, slightly below the iliac crest, to the starting point.

2. Step two, the anterior approach (Figure 2), is done in the following manner.

a. Detach the abdominal muscles, the inguinal ligament and the rectus abdominis muscle from their respective iliac and pubic attachments.

b. By retracting the spermatic cord

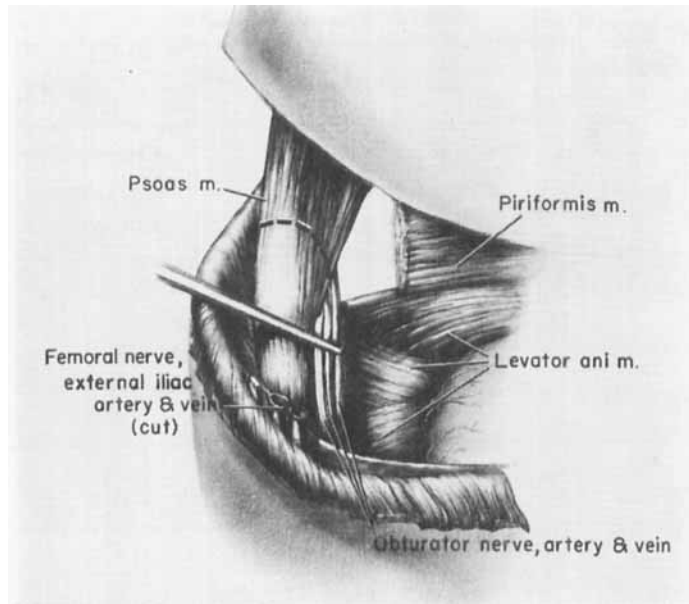
and peritoneum upward and medialward, ligate and divide the external iliac artery and vein and then cut the femoral nerve at the same level.

c. By retracting the bladder into the pelvis, the pubic symphysis is disarticulated by means of complete division of its ligaments and fibrocartilage.

3. Step three, the perineal approach (Figure 3), is accomplished by detaching the ischiocavernosus, the transverse perineal and the origin of the upper levator ani muscles from the pubic bone in a subperiosteal manner.

4. Step four, the posterior approach

*Figure 5. The intrapelvic resection.*



(Figures 4 and 5), is performed in the following order.

a. Detach the remaining abdominal muscles, the quadratus lumborum and the erector spinae muscles from the ilium.

b. Divide the gluteus maximus slightly above its insertion at linea aspera and retract the whole muscle together with its overlying skin and subcutaneous

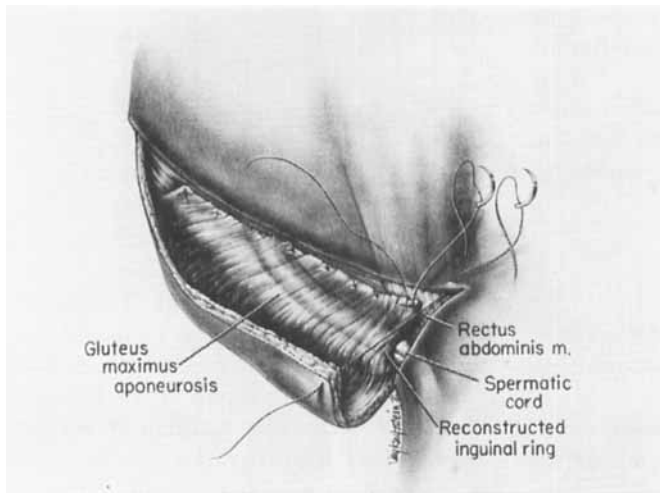
tissue as one flap upward and medialward.

c. Divide the piriformis muscle and the sciatic nerve.

d. Disarticulate the sacroiliac joint with a gigli saw.

e. Cut the sacrotuberous and sacrospinous ligaments.

f. Through the anterior incision, ligate and divide the obturator artery and vein



*Figure 6. The reconstruction of inguinal ring and canal and skin closure.*

Table 4.

Number of patients	Nature of disease	Site	Results
1	Chondrosarcoma	Proximal femur	All had local recurrence which required subsequent hindquarter amputation
1	Fibrosarcoma	Soft tissue of thigh	
1	Malignant mesenchymoma	Soft tissue of thigh	

Table 5.

Duration	1 year		2 years		5 years and more	
	Dead	Living	Dead	Living	Dead	Living
Number of patients	5	14	9	10	11	8
Per cent	26.3	73.7	47.4	52.6	57.9	42.1

and cut the obturator nerve and the psoas muscle.

g. Completely detach the levator ani muscle from the pubic bone to free the entire hindquarter.

5. Step five, the closure (Figure 6), is done in the following manner.

a. Reconstruct an external inguinal ring for the passage of spermatic cord by selectively suturing the lower medial corner of the gluteus maximus aponeurosis to the rectus abdominis and the medial portion of the abdominal muscles.

b. The remaining gluteus maximus flap is sutured to the lateral portion of the abdominal muscles and the quadratus lumborum and psoas muscles.

c. After the insertion of soft rubber drains or plastic suction tubings, the skin and subcutaneous tissues are closed in the usual manner.

## RESULTS

*Recurrence.* The incidence of recurrence of tumors following local resection is summarized in Table 4.

*Survival rates.* The overall short-term and long-term survival rates of our 19 patients are shown in Table 5.

The comparison of the 5-year survival rates between malignant soft tissue tumors and malignant bone tumors is presented in Table 6.

Table 6.

Disease	Number of patients		5-year survival rate
	Dead	Living	
Malignant soft tissue tumors	4	6	60 %
Malignant bone tumors	7	2	22.2 %

## DISCUSSION

Although hindquarter amputation is an extremely mutilating operation, it is still the only reliable way of completely eradicating malignant tumors from the buttock, hip and upper thigh region, provided that metastases have not yet taken place. Our experience of a 42 per cent overall 5-year survival rate compares favorably with the published series in the medical literature which are shown in Table 7.

Table 7.

Author	Year	Number of patients	5-year survival rate (per cent)
Gordon-Taylor & Munroe	1952	50	20
Higginbotham & Coley	1956	39	40
Lewis & Bickel	1957	50	50
Bailey & Steven	1961	16	25
Pack & Miller	1964	53	20.8
Marcove et al.	1972	65	51

However, in order to improve our patients' long-term survival rate, adjuvant chemotherapy is now routinely employed in treating certain malignant tumors, such as osteogenic sarcoma, Ewing's sarcoma, embryonal rhabdomyosarcoma, etc. Furthermore, in addition to surgery, radiotherapy and chemotherapy, we believe that immunotherapy will be added to our armamentarium when its effectiveness has been unequivocally proven.

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