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FULL PAPER

Primary high-grade soft-tissue sarcoma of the buttock: a rare but distinct clinical entity

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Objective: Sarcoma arising in the region of the buttocks is a rare entity and therefore no consensus regarding management exists in the literature.

Methods: 16 patients diagnosed with localized, non-metastatic primary soft-tissue sarcoma (STS) in the buttock area, who were consecutively treated between 2005 and 2013, were retrospectively evaluated for the rate of local control, distant metastases and overall survival.

Results: Most tumours were classified as high grade (87.5%). The average time between the appearances of symptoms to diagnosis of sarcoma was 4.5 months. At the end of the observation period, 7 (44%) patients were alive without signs of progressive disease, 37.5% patients died as the disease progressed, 13 patients were free of disease and 3 (19%) patients were alive with signs of progressive disease. Seven (44%) patients developed local recurrence. Six (37.5%) patients developed distant metastases. The lung was the most common site of distant failure (four

patients); other sites were the liver as well as the adrenal gland and kidney (one patient). Four patients had both distant and local progression, three patients experienced isolated local recurrence and two patients developed isolated distant metastases. 5-year local recurrence-free survival was 58% and 5-year distant metastases-free survival was 63%.

Conclusion: It is unclear whether to subsume STS of the buttock under the rubric of pelvic tumours or tumours of the lower extremity. Either way, STS of the buttock seems to be characterized by local control, freedom from distant relapse and survival, which is inferior to accepted standards for either pelvic or lower extremity sarcomas. To improve this poor outcome, oncologists are encouraged to regard sarcoma of the buttock as a distinct clinical entity and to devise innovative therapeutic strategies accordingly.

Advances in knowledge: Sarcoma of the buttock area should possibly be regarded as a distinct entity.

INTRODUCTION

Soft-tissue sarcoma (STS), a rare malignant disease originating from the mesenchymal tissues, comprises approximately 1% of all tumours diagnosed.¹ The prognostic factors that impact survival in this disease are histological grade, tumour size and the location of the tumour in relation to the fascia (deep or superficial planes). Factors that carry less prognostic import include histological type, age and anatomic site.² A widely accepted nomogram for the prediction of survival among patients with sarcoma was devised, according to division into anatomic subtypes such as the upper and lower extremities, viscera, thorax and retroperitoneum as well as head and neck location.³ Indeed, results are markedly different for visceral and retroperitoneal sarcoma in comparison with disease in the extremities.

Our institution represents a national referral centre for the management of STS. While comprehensively summarizing

our data,⁴ we observed that patients diagnosed with sarcoma arising in the region of the buttocks had a particularly poor outcome. Accordingly, we sought to formally analyze this subgroup of STS.

Since sarcoma originating in the region of the buttocks constitutes an unusual presentation, no consensus towards management of this entity exists in the literature. Usually, sarcoma of the buttocks is grouped with sarcoma of the thigh; however, it is unclear whether the two behave similarly, and some authors have grouped sarcomas of the buttock with sarcoma of the pelvis. We collected 16 patients with STS of the buttocks for the study and subsequent hypothesis generation.

METHODS AND MATERIALS

16 consecutive patients diagnosed with primary STS and bone sarcoma located in the buttock area were treated at our institution between 2005 and 2013. All patients were

observed until death or September 2014. Median follow-up was 48.5 months from the date of diagnosis. An “event” refers to death, any type of local recurrence or distant metastases (usually identified by CT). Outcome data were retrospectively evaluated after permission for analysis was obtained from the institutional review board. Two patients were treated pre-operatively (50 Gy in 25 fractions), the remainder received adjuvant radiation therapy following surgical intervention. Three patients received radiation therapy *via* hypofractionated schema (39 Gy in 13 fractions), while the remainder were irradiated with conventional regimes (63–68.4 Gy; 1.8 Gy per fraction). Three-dimensional conformal radiation techniques were employed.

In general, our guidelines for treating STS of the buttock were based on the use of wide margins around the gross tumour volume and avoidance of adjacent organs while respecting natural anatomic barriers.

We calculated the rates of local and distant recurrence as well as overall survival of patients. Kaplan–Meier curves for local control and freedom from distant relapse were plotted. We assessed disease control as a function of tumour size, location within the buttock area, histological subtype and margin status.

RESULTS

There were 16 patients in the study; 8 patients were females and 8 patients were males. The average age of the patients was 56 years. The demographics of the patients are presented in [Table 1](#). Most of tumours were classified as high grade (87.5%).

Of note, the “Ewing sarcoma” was an extraosseal subcutaneous Ewing sarcoma (which is generally classified as an STS⁴). The average time between the appearances of symptoms to diagnosis of sarcoma was 4.5 months (standard deviation 2.7 months). The average volume of the tumours was 813.4 cm³ ([Figure 1](#)).

For the locally recurrent cases, one patient underwent resection of tumour and other two patients received palliative radiation therapy. Two patients were treated by neoadjuvant chemotherapy before the primary surgery; four patients were given palliative chemotherapy. Two patients received stereotactic body radiation therapy for limited lung oligometastases. All the patients underwent limb-sparing operations. In 6 (37.5%) out of 16 patients, surgery was considered to be “marginal excision.”

At the conclusion of the period of study, seven (44%) patients were alive without signs of progressive disease. Six (37.5%) patients died as the disease progressed. 13 patients were free of disease at the end of the observation period. Three (19%) patients were alive with signs of progressive disease. 7 (44%) patients out of 16 patients developed local recurrence. Six (37.5%) patients developed distant metastases. Four patients had both distant and local progression, three patients experienced isolated local recurrence and two patients developed isolated distant metastases ([Table 2](#)). The lung was the most common site of distant failure (four patients); other sites were the liver (one patient in addition to lung), adrenal gland and kidney (one patient). 5-year local recurrence-free survival was 58% and 5-year distant metastases-free survival was 63% ([Figure 2](#)).

Table 1. Soft-tissue sarcoma of the buttock: patient characteristics

Number	Gender	Age	Pathology	Grade	Tumour volume (cc)	Margins (mm)	Type of surgery
1	f	63	Spindle cell	2	127	2	WLE
2	m	22	HG spindle cell	3	54	1	WLE
3	m	51	Subcutaneous Ewing extraskeletal	3	43	7	WLE
4	m	83	HGSTS	3	27	Unknown	WLE
5	f	53	Pleomorphic	3	684	Positive	WLE
6	m	41	Pleomorphic	3	1000	Unknown	Marginal
7	m	57	MFH	3	5.5	4	Marginal
8	m	18	MPNST	3	189	4	WLE
9	f	67	LS	1	1200	Positive	WLE
10	f	41	Spindle cell	3	1200	1	Marginal
11	f	62	SFT	3	Unknown	Unknown	WLE
12	f	86		3	4224	2	Marginal
13	m	67	LS	3	2925	Positive	WLE
14	m	75	MyxoFS	3	2400	10	Marginal
15	f	51	Spindle-cell sarcoma	3	360	1	WLE
16	f	60	LMS	3	Unknown	Unknown	Marginal

f, female; HG, high grade; HGSTS, high-grade soft-tissue sarcoma; LMS, leiomyosarcoma; LS, liposarcoma; m, male; MFH, malignant fibrous histiocytoma; MPNST, malignant peripheral nerve sheath tumour; MyxoFS, myxofibrosarcoma; SFT, solitary fibrous tumour; WLE, wide local excision.

Figure 1. A typically diagnosed soft-tissue sarcoma which appeared in the buttock.

DISCUSSION

The rarity of sarcoma of the buttock makes it difficult to draw firm conclusions about clinical presentation and management of this entity.⁵ At our institution, a national centre for STS, approximately 60 primary resections of STS are performed annually. On an average, three (5%) new patients with sarcoma in the buttock region are referred to our medical centre for management each year.

Sarcoma of the buttock has typically been subsumed under the rubric of STS of either the trunk or extremity by researchers in the field. Brant et al⁶ included sarcomas of the buttock with sarcomas of the “trunk”. This is somewhat surprising, since gluteal muscles are typically characterized as muscles of the lower limb rather than the trunk.⁷

The principal treatment of localized STS arising in these regions is considered to be wide resection with adjuvant radiation and to a lesser extent, chemotherapy. The success of surgery is dependent on the attainment of R0 resection with wide margins.⁸ Adjuvant radiation therapy is an integral part of the limb-sparing approach. It is generally accepted that the addition of radiation therapy, either before or after surgery, reduces the risk of local recurrence by approximately 25%.^{8,9} It is possible that the results of our series were compromised by suboptimal operations, which created an insurmountable “tumour control hurdle” for the radiation doses that could be safely administered during the period of study. Fortunately, both surgical and irradiation techniques continue to evolve.

Table 2. Soft-tissue sarcoma of the buttock: patterns of local and distant failure

Type of recurrence	Yes	No
LR	7 (44%)	9 (56%)
DM	6 (37.5%)	10 (62.5)
Isolated LR	3 (23%)	13 (77%)
Isolated DM	2 (12.5%)	14 (87.5%)
Both LR and DM	4 (25%)	12 (75%)

DM, distant metastases; LR, local recurrence.

Radiation therapy has had a major impact on the management of sarcoma of the extremity. There, the local control rate—using a combined modality regimen including local resection and radiation therapy—approaches 85–90% at 10 years.¹⁰ In the present series, which was restricted to STS of the buttock, local control rates were considerably less favourable, in the vicinity of only 57% at 5 years.

Several hypotheses may explain the inferior outcomes of gluteal sarcoma. First, there may be an anatomical disadvantage to STS of the buttock because unlike the case of tumours in the remainder of the extremity, a true compartment probably does not exist. Indeed, one of the fundamental postulates of the local pattern of sarcoma growth is the tendency of such tumours to respect structural borders.¹¹ The anatomical characteristics of the gluteal fascia lie in the enclosures of the gluteus maximus and tensor fascia lata, covering the gluteus medius and bounding to the skin below the gluteus maximus. The fascia of the gluteus maximus is continuous with the fascia lata.¹² It is thus apparent that there are no well-defined planes that can locally confine sarcoma of the buttock.

A second reason for the inferior outcome may be related to delays in diagnosis. The large muscle mass in the buttock typically allows for hidden unrestricted growth of the tumour to relatively large sizes. Since there is a decided lag until tumours in the gluteal region become symptomatic, there is a tendency to pursue work-up and establish a diagnosis at fairly advanced stages of growth. Third, the data were collected before our institution adopted intensity-modulated radiotherapy techniques for this entity. In a recent article by Folkert et al,¹³ it was suggested that intensity-modulated radiotherapy could improve outcome in the setting of STS. Finally, even expert sarcoma surgeons encounter challenges when dealing with sarcoma of the buttock owing to the proximity of the sciatic nerve and the tendency for prolongations of wound closure in this region.

There are few published articles in the literature that address the behaviour of sarcoma originating in the buttock. Most of the published data pertaining to pelvic and buttock sarcoma were gleaned from case reports or radiological series.¹⁴ The rate of local recurrence described by Behranwala et al¹⁵ at 2 years was

Figure 2. Kaplan-Meier survival curve for local control and distant metastases. The graph describes the Kaplan-Meier survival curve for the local relapse-free survival (LRFS) and distant metastases-free survival (DMFS) in months (mo) for patients with soft-tissue sarcoma of the buttock.

20.9% [standard error (SE), 6.8%]. The 2-year overall and disease-free survival rates were 64.1% (SE, 6.7%) and 48.5% (SE, 6.4%), respectively. These disappointing results, in fact, are not dissimilar to our findings.

Benchmark outcomes for STS were established by investigators from the Memorial Sloan Kettering Cancer Center. Their nomogram, which primarily describes the probability of survival of STS, divides the anatomical sites as extremities, thoracic/trunk and head and neck region. The investigators at the Memorial Sloan Kettering Cancer Center detected an orderly gradient of prognosis that ranks best outcomes as follows: extremities, thoracic, trunk and lastly tumours of the head and neck region.³ We suggest that it is misleading to include sarcoma of the buttock under the rubric of sarcoma of the lower extremity, since the former appears to have a markedly worse prognosis than the latter. Moreover, we propose that clinicians begin to regard sarcomas arising in the buttock as a distinct entity, rather than combining such tumours with other forms of STS.

There is precedent for isolating anatomic subsites in sarcoma. Most notably, gradual but reproducible progress has been made in the management of STS of the head and neck region, ever since those tumours were categorized separately.^{3,16} As an example, Singh et al¹⁶ reported high rates of local and distant

recurrences (42%) among 36 patients with sarcoma of the head and neck. Accordingly, we propose that investigators begin to regard sarcoma of the buttock region as a distinct entity, so that interventions can be tailored to the unique clinical challenges which emerge.

The major qualification of this report is the relatively small number of patients included in the study. Unfortunately, limited numbers of patients with sarcoma of the buttock will be available from any single centre summarizing its experience with STS of the buttock. Moreover, we acknowledge the impossibility of drawing firm conclusions from tumours that were not uniformly treated. We suggest that centres of excellence begin to aggregate data, to understand their respective experiences with sarcoma of the buttock. In the meantime, we submit that sarcoma of the buttock be regarded as a unique clinical entity worthy of aggressive therapeutic responses, ideally *via* protocols conducted in a multi-institutional context.

CONCLUSION

STS of the buttock is characterized by local control, freedom from distant relapse and survival, which is inferior to accepted standards for other pelvic sarcomas. To improve this poor outcome, oncologists are encouraged to regard sarcoma of the buttock as a distinct clinical entity and to devise innovative therapeutic strategies accordingly.

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