



FC-130

Clinical presentation and outcome of giant cell tumor of the pelvis and sacrum

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Background: Giant cell tumours of bone affecting the pelvis are rare but challenging to treat. We have evaluated our treatment of these tumours over a 36 year period to offer insights into management and suggest treatment in the modern era.

Methods: 43 patients with benign GCT in the pelvis and sacrum were studied. Treatment included radiotherapy, embolization, bisphosphonates and Denosumab, with or without surgery. Blood loss, recurrence rate, complications and functional scores were noted.

Results: 26 were females and 17 males with a median age of 37. Median follow-up was 54 months (1 - 222 months). The sacrum was involved in 22 patients, ilium in 9, ischium in 7 and pubis in 5 patients. Pain in lower back and buttock radiating down the leg was the most common symptom. Median duration of symptoms before diagnosis was 32 weeks (0 - 1040 weeks). Visceral symptoms occurred in 9 patients (21%) and neurological symptoms in 21 (49%). Surgery including extended curettage or resection was performed in 32 patients and 9 patients were treated non-operatively with embolization +/- radiotherapy (n=4) or embolization +/- Denosumab (n=5). Blood loss ranged from minimal (<100ml) to a maximum of 16,000 ml. Blood loss was higher for curettage (mean 5274ml) versus resection (mean 2850ml). Surgical complications included 2 cardiac arrests during surgery due to massive intra-operative blood loss. Local recurrence (LR) occurred in 13 patients (30%) with 85% of the recurrences occurring within 24 months, but no patient developed metastases or died from the condition or its treatment. Mean MSTS functional score was 74% (23-100%) which appeared better in patients treated non-operatively with Denosumab (mean 88%).

Conclusions: Therapy for pelvic and sacral GCT is evolving. Modern treatment may well be multidisciplinary involving surgery, drug treatment, embolization and sometimes radiotherapy.

Level of Evidence: Level II, retrospective study.

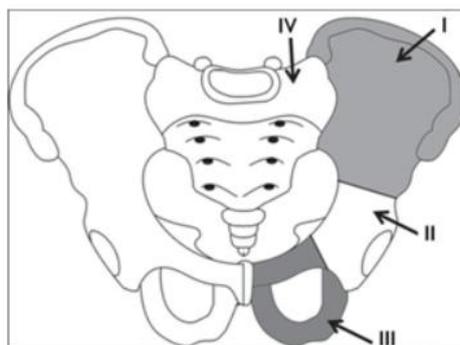


Figure 1. Modified classification system by Enneking & Dunham (1978).
Region I: ilium, Region II: acetabular, Region III: ischiopubis, Region IV: sacrum

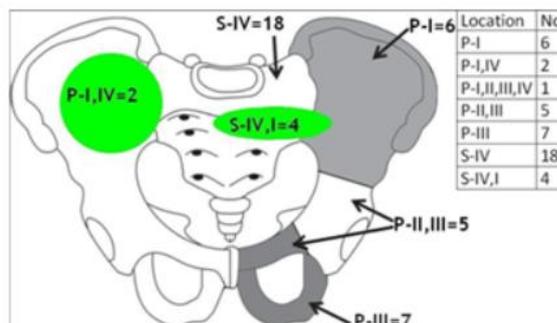


Figure 2. Tumor locations; P-I: Ilium (6), P-I, IV: ilium with sacral extension (2), P-I, II, III, IV: ilium with extension to all areas (1) (not illustrated), P-II, III: acetabulum and ischiopubis (5), P-III: ischiopubis (7), S-IV: sacrum (18), S-IV, I: sacrum with extension to the ilium

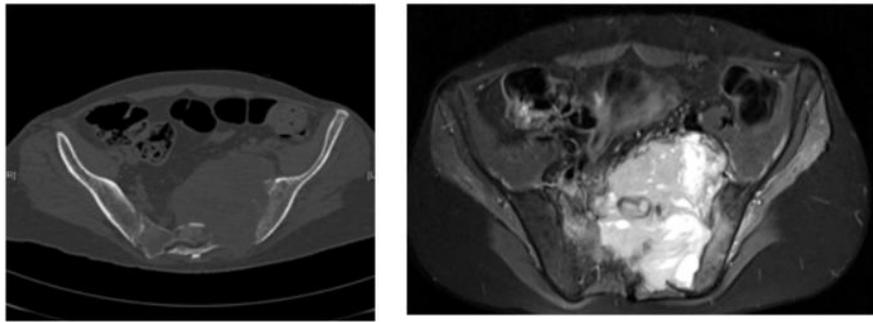


Figure 3. CT and MRI of a typical GCT of the sacrum showing extensive bone loss and anterior soft tissue extension

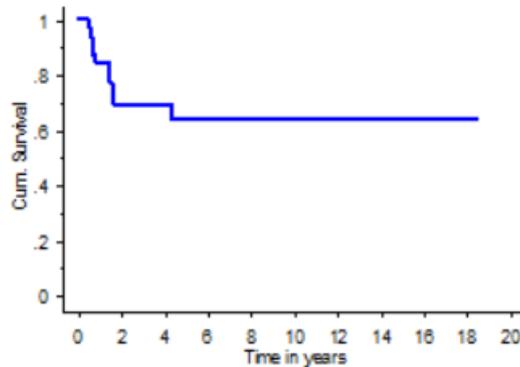


Figure 4. Kaplan Meier survival curve showing local recurrence free survival

Nr	Age/Sex	Duration of symptoms	Type of symptoms	Site	Stage	Diameter	Therapy	Blood loss (ml)	Complications	Local recurrence	Follow-up	MSTS
1	F15	28	P+V+N	s-IV	3	90	SAE-C	15500	cardiac arrest, foot drop, sensory loss perianal region, infection	yes, 18	280	100%
2	F38	13	N	s-IV	3	180	C+SS-BP-C+EBI-SAE	2000	sensory loss perianal region, double incontinence, EBI induced menopause	yes, 10	77	77%
3	F35	60	P+V	s-IV	3		C-C	13000	cardiac arrest	yes, 10	137	100%
4	F14		P+N	s-IV	3		C		no	no	1	100%
5	F48	36	P+WL	p-II,III	3	30	SAE-C-SAE-C+EBI-E-BP-C+CMT	400	pain, urine incontinence, foot drop, ischaemic claudication	yes, 7	114	23%
6	M49	1040	P+N	s-IV	3	100	C+EBI	3800	pain, erectile disorder	no	222	37%
7	M34	10	P	p-III	3	100	C	100	AVN femoral head	yes, 8	51	57%
8	F25	32	P	s-IV,I	3	110	C	16000	no	no	132	100%
9	M35	52	P+L	p-I,IV	3	120	SAE-C-C	1000	infection, motor weakness	yes, 52	71	53%
10	F50	250	P+L+N	p-I,IV	3	120	C	1500	infection	no	85	100%
11	F47	170	P+WL+V+N	p-I,II,III,IV	2		C-EBI-C+THR-C	8600	motor weakness	yes, 20	61	37%
12	F68	52	P	p-II,III	3		C	100	floating hip, faecal incontinence	yes, 18	112	43%
13	F37	8	whoops	p-I	3	75	C+H2O2		numbness around the scar	no	59	100%
14	F52	0	whoops+ V	s-IV	3	80	R	1800	no	no	87	100%
15	F18	104		p-III			R		no	yes, 19	265	
16	F59	52	P	p-III	3		R	8300	numbness left thigh	no	115	93%
17	M41	416	V+N	s-IV,I	3	60	EBI-SAE	-	erectile dysfunction after EBI	no	13	
18	F22	70	P+WL+N	p-I	3	180	no		N/A		1	
19	M41	32	P	p-I	2		SAE	-	SVT during anaesthesia for embolization	no	75	93%
20	F46	32	P+N	s-IV	3	80	SAE-BP-EBI-SS-Sling operation	2500	bladder retention+incontinence+UTI, bowel problems, EBI induced menopause, infection	no	107	53%
21	M50	20	P+L+V	p-II,III	3	200	hemipelvectomy	3690	mild urge incontinence bowel and bladder	no	13	67%
22	M15	10	N	s-IV	2	50	SAE-C+ALL-D	7000	diarrhoea + osteonecrosis of the jaw	yes, 6	54	100%
23	F15	13	P+N	s-IV	3	94	D-SAE-C-E-D	4000	leg weakness when standing	no	5	50%
24	M36	13	N	s-IV	3	120	D-R-EBI-SS-D	500	lumbar pain	yes, 8	36	57%
25	F67	26	P+N	s-IV	3	60	D	-	no	no	12	100%
26	F18	36	P	s-IV	3	96	D	-	severe hypocalcaemia, nausea	no	15	87%

Table 1a



Nr	Age/Sex	Duration of symptoms	Type of symptoms	Site	Stage	Diameter	Therapy	Blood loss (ml)	Complications	Local recurrence	Follow-up	MSTS
27	F31	35	P+N	s-IV	3	98	SAE-D		no	no	26	63%
28	M55		P+L	p-I	3	170	D	-	no	no	45	100%
29	M61	12	P	p-II,III	2	125	D		no	no	10	
30	F58	18	P+V+N	s-IV	3	40	SAE-C+ALL	3060	numbness surgical site	no	7	77%
31	F56			p-III			C		no		44	
32	M24	5		p-III			C		no		20	
33	M29	78		p-I			R		no		64	
34	M23	16		p-III			R		no		29	
35	M39	36		p-III			R		no		58	
36	F27	34	P+V+N	s-IV	3	80	D-R	800	atypical femoral stress fracture	no	27	
37	M62	6		p-I	3		R		no		6	
38	F31	74	P+N	s-IV,I	3	62	C-SAE-D-R+C	3600	no	yes, 40	46	43%
39	F39	26	P	p-II,III	3	50	no		N/A		1	
40	F30	1	whoops+ N	s-IV	3		no		N/A	no	2	
41	M18	13	P+N	s-IV	3		SAE-C+SS	5000	infection	no	111	100%
42	M28	130	P+N	s-IV,I	3	110	C-SAE-D+BP	5000	Abdominal discomfort, urinary incontinence	yes, 19	107	
43	F44	4	P+V+N	s-IV	3	70	EBI	-	no		184	40%

Table 1. Number of patients (nr), Age/sex, Duration of symptoms, Type of symptoms; P=pain of tumor site, L=Lump, N=neurological symptoms, V=Visceral symptoms, WL=weight loss, Whoops=incidental discovery Tumor location (site); p=pelvis, s=sacrum, I=ilium, II=acetabulum, III=iliopubis, IV=sacrum. Comanacci stage (Stage), Diameter in mm, Therapy; C=curettage, R=resection, SAE=selective arterial embolization, EBI=external beam irradiation, BP=bisphosphonates, D=denosumab, SS=spinal stabilization, ALL=allograft, CMT=bone cement, H2O2=hydrogen peroxide, THR=total hip replacement
Blood loss in ml, Complications, Local Recurrence +months until local recurrence, Follow-up in months, Functional scores (MSTS) in %

	No. patients	Median age	%Female	Duration of symptoms (months)	LR-rate	MSTS (mean)	Median follow-up (months)
Balke 2009	20	41	60%	-	5%	-	36
Balke 2012	19	25	68%	-	37%	-	36
Dahlin 1986			56%				
Donati 2008	10	33	30%	Mean: 6	20%	-	96
Guo 2012	27	27	66%	-	15%	77%	41
Vd Heijden 2013	26	41	58%	-	54%	80%	98
Kattapuram 1996	7	26	86%	-	43%	-	67
Li 2012	32	31	56%	-	38%	-	42
Leggon 2004	16	27	-	Mean: 12	24%	-	74
Osaka 1987	5	32	80%	Mean: 3 Median: 5	0%	-	135
Ruggieri 2010	31	-	-	-	10%	-	108
Sanjay 1993	19	31	79%	Mean: 8	21%	-	-
Current study	43	37	60%	Mean: 18 Median: 7	30%	74%	54

Table 2. Demographics and outcomes in other studies on pelvic and sacral giant cell tumor, comparing number of patients, median age, percentage of females, duration of symptoms in months, local recurrence rate in percentages, functional outcome in percentages and median follow-up in months