POSTER 35

Periacetabular Internal Hemipelvectomy With and Without Sacral Resection: An Institutional Experience and Systematic Review

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BACKGROUND: Internal hemipelvectomy is a limb sparing procedure most commonly indicated for malignant bone and soft tissue tumors of the pelvis. Partial resection and pelvic reconstruction may be challenging for orthopedic oncologists due to late presentation, high tumor burden, and complex anatomy. Specifically, wide resection of tumors involving the periacetabular and sacroiliac (SI) regions may compromise adjacent vital neurovascular structures, impair wound healing, or limit functional recovery. Moreover, since implants are commonly fixed to the sacrum, concomitant sacral resection reduces viable bone for good screw purchase, possibly compromising construct durability and creating lumbosacral instability.

PURPOSE: To present a series of patients treated at our institution who underwent periacetabular internal hemipelvectomy (Type II) with or without sacral extension (Type IV). To validate our findings, we systematically reviewed existing literature to investigate postoperative complications, functional outcomes, and implant and patient survival following pelvic tumor resection via Type II hemipelvectomy with or without Type IV resection.

PATIENTS AND METHODS: A surgical registry of consecutive patients treated with internal hemipelvectomy for primary or secondary pelvic bone tumors at our institution since 1994 was retrospectively reviewed. All type II resection patients were stratified into two separate cohorts, based on whether or not periacetabular resection was extended beyond the SI joint to include the sacrum (Type IV), as per Enneking and Dunham classification. Patient demographics, operative parameters, complications, and oncological outcomes were collected. Categorical and continuous variables were compared with Pearson's chi square or Fisher's exact test and the Mann-Whitney *U*-test, respectively. Literature review according to PRISMA guidelines queried studies pertaining to patient outcomes following periacetabular internal hemipelvectomy. The search strategy included combinations of the key words "internal hemipelvectomy", "pelvic reconstruction", "pelvic tumor", and "limb salvage". Pooled data was compared using Pearson's chi square. Statistical significance was established as $p < .05$.

RESULTS: A total of 76 patients were treated at our institution with internal hemipelvectomy for pelvic tumor resection, of whom 21 had periacetabular resection. Fifteen patients underwent Type II resection without Type IV involvement, whereas six patients had combined Type II/IV resection. There were no significant differences between groups in operative time, blood loss, complications, local recurrence, postoperative metastasis, or disease mortality. Systematic review yielded 69 studies comprising 929 patients who underwent internal hemipelvectomy with acetabular resection (**Table 1**). Of these, 906 (97.5%) had only Type II resection while 23 (2.5%) had concomitant Type II/IV resection. While overall complication rates were comparable, Type II resection alone produced significantly fewer neurological complications when compared to Type II resection with sacral extension (3.9% vs. 17.4%, $p = .001$). No significant differences were found between rates of wound complications, infections, or construct failures. Local recurrence, postoperative metastasis, and survival outcomes were similar (**Table 2**). Type II internal hemipelvectomy without Type IV resection on average produced higher postoperative MSTS functional scores than with Type IV resection.

CONCLUSION: Surgical treatment of pelvic tumors remains challenging and requires meticulous preoperative planning and execution. In our series, the two groups exhibited no differences. From systematic review, operative parameters, local recurrence or systemic metastasis, implant survival, and disease mortality were comparable in patients undergoing Type II internal hemipelvectomy alone compared to patients undergoing some combination of

Type II/IV resection. However, compound resections increased the risk of neurological complications and poorer functional results. These findings suggest concurrent type IV resection may be performed as safely as type II resection alone, yet careful consideration of operative risks, functional recovery, and oncological prognosis is necessary to tailor the appropriate resection approach to each patient.

Table 1. Pooled patient demographics and histopathologic diagnoses from the literature.

	All Patients	**Without Type IV**	**With Type IV**
Studies		68	8
Age	41.2% (2-79)	41.5 (2-79)	29.0 (6.7-63)
Female	42.4% (365/860)	42.4% (355/837)	43.5% (10/23)
Follow-Up (months)	57.6 (0.5-408)	57.4 (0.5-408)	69.6 (15-188.4)
Resection Type			
Osteosarcoma	18.3% (170/929)	18.2% (165/906)	21.7 (5/23)
Chondrosarcoma	39.2% (364/929)	39.7% (360/906)	17.4% (4/23)
Ewing's Sarcoma	13.3% (124/929)	12.4% (112/906)	52.2% (12/23)
Giant Cell Tumor	6.7% (62/929)	6.8% (62/906)	0% (0/23)
UPS	1.6% (15/929)	1.7% (15/906)	0% (0/23)
Fibrosarcoma	0.9% (8/929)	0.9% (8/906)	0% (0/23)
Metastatic Disease	11.3% (105/929)	11.5% (104/906)	4.3% (1/23)
Other	8.7% (81/929)	8.8 (80/906)	4.3% (1/23)
Resection Type			
II	29.6% (275/929)	30.4% (275/906)	-
I/II	21.7% (202/929)	22.3% (202/906)	-
II/III	33.2% (308/929)	34.0% (308/906)	-
I/II/III	13.0% (121/929)	13.4 (121/906)	-
I/II/IV	1.8% (17/929)	-	73.9% (17/23)
I/II/III/IV	0.6% (6/929)	-	26.1% (6/23)
Reconstruction			
Custom Endoprosthesis	15.2% (141/929)	15.5% (140/906)	4.3% (1/23)
Saddle Endoprosthesis	10.8% (100/929)	10.9% (99/906)	4.3% (1/23)
Modular Endoprosthesis	9.5% (929)	9.7% (88/906)	0% (0/23)
Iliac Stem	19.7% (183/929)	20.2% (183/906)	0% (0/23)
Allograft/APC	12.6% (117/929)	12.5% (113/906)	17.4% (4/23)
Autograft	18.8% (175/929)	18.8% (170/906)	21.7% (5/23)
None	13.5% (125/929)	12.5% (113/906)	52.2% (12/23)

UPS, Undifferentiated Pleomorphic Sarcoma; APC, Allograft-Prosthesis Composite

Table 2. Postoperative complications and oncologic outcomes.

	All Patients	Without Type IV	With Type IV	*p*
Complication Rate	52.9% (479/905)	52.8% (466/882)	56.5% (13/23)	.727
Wound	6.4% (58/905)	6.2% (55/882)	13.0% (3/23)	.188
Infection	16.4 (148/905)	16.4% (145/882)	13.0% (3/23)	.664
Neurologic	4.1% (37/905)	3.9% (34/882)	17.4% (4/23)	**.001**
Other	5.3% (48/905)	5.4% (48/882)	0% (0/23)	.250
Construct Failure	20.7% (187/905)	20.3% (184/882)	13.0% (3/23)	.361
Dislocation	9.8% (89/905)	9.8% (86/882)	13.0% (3/23)	.549
Fracture	3.8% (905)	3.6% (32/882)	8.7% (2/23)	.207
Loosening	5.3% (905)	5.4% (48/882)	0% (0/23)	.250
Other Failure	2.0% (18/905)	2.0% (18/882)	0% (0/23)	.490
Oncologic Outcome				
Local Recurrence	15.7% (146/929)	15.7% (142/906)	17.4% (4/23)	.823
Systemic Metastasis	20.8% (188/904)	21.0% (185/881)	13.0% (3/23)	.353
NED	60.1% (535.890)	60.0% (520/867)	65.2% (15/23)	.613
AWD	11.6% (103/890)	11.8% (102/867)	4.3% (1/23)	.272
DOD	24.5% (218/890)	24.5% (212/867)	26.1% (6/23)	.857
LTFU	0.8% (7/890)	0.7% (6/867)	4.3% (1/23)	.051

Bolding *denotes statistical significance ($p < .05$)*

NED, No Evidence of Disease; AWD, Alive with Disease; DOD, Dead of Disease; DOC, Dead of Other Causes; LTFU, Lost to Follow-Up