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## Analysis of pelvic and non-pelvic chondrosarcoma postoperative recurrence risk factors in 65 cases among 3 ethnic groups (Han, Uyghur, and other nationalities)

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### Abstract

**Background:** Chondrosarcomas are a rare tumor that has a variable biological characteristic, also their treatment clinically and surgically is controversial. So, authors are analyzing the related risk factors of influencing the postoperative recurrence of chondrosarcoma. **Methods:** Retrospective analysis of clinical data, a total of 65 cases of chondrosarcoma were collected from January 2002 to June 2016 in our hospital database and divided into 2 groups (pelvic and non-pelvic chondrosarcoma) with 3 ethnic class (Han, Uyghur, and other nationalities) of Chinese people. The clinical characteristics and prognostic risk factors of chondrosarcoma recurrence were analyzed by different statistic methods. **Results:** The age, sex, nationality, surgical method, pathological grade and Enneking stage of chondrosarcoma patients were not significantly correlated with postoperative recurrence ( $P>.05$ ); but the site of tumor growth was significantly correlated with postoperative recurrence ( $P<.001$ ). Cox regression model multivariate analysis showed that tumor growth site was an independent factor influencing postoperative recurrence of chondrosarcoma, and the risk of postoperative recurrence of pelvic chondrosarcoma was 3.610 times higher than non-pelvic chondrosarcoma. **Conclusion:** The recurrence rate of pelvic chondrosarcoma was significantly higher than non-pelvic chondrosarcoma.

**Keywords:** Chondrosarcoma, Postoperative recurrence, Surgery, Retrospective analysis.

### INTRODUCTION

Chondrosarcoma originates from cartilage tissue and is the second-largest primary malignant tumor of bone [1]. It can be divided into different histological types according to histological characteristics and pathological sites. Besides, the tumors have considerable variation in outcome depending on size, histologic grade, Musculoskeletal Tumor Society (MSTS) stage, and tumor type. The effect of chemoradiotherapy on chondrosarcoma is poor [2]. Surgical treatment is the only known treatment with definite results at present. Due to the complicated and special anatomical structure, it's difficult for resection and reconstruction of the site. So, it's clinical treatment is always challenging. Postoperative tumor recurrence brings patients the pain of multiple operations and heavy economic burden and reducing the recurrence rate is an urgent problem in the clinical field. Retrospective analysis of clinical data of 65 patients with chondrosarcoma diagnosed by surgery and pathological examination. In this study, summarize the clinical characteristics of pelvic and non-pelvic chondrosarcoma and analyze its post-operative recurrences with prognostic risk factors.

### MATERIALS AND METHODS

#### General information

From January 2002 to June 2016, patients visited the orthopedics department of the hospital and received surgical treatment. A total of 89 patients were diagnosed with chondrosarcoma. Inclusion criteria: (1) patients with chondrosarcoma treated surgically; (2) complete medical records and follow-up data. Exclusion criteria: patients with incomplete medical records or lost to follow-up. 65 patients were included in the study finally. There were 37 males and 28 females; The patients ranged in age from 13 to 81 years, with an average age of 46.4 years; 23 cases were  $\leq 40$  years old, and 42 cases were  $>40$  years old.

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There were 33 cases of Han, 16 cases of Uyghur and 16 cases of other nationalities. The tumor was found in 25 cases of pelvic and 40 cases of non-pelvic (15 cases of the femur, 3 cases of humerus, 7 cases of scapula, 2 cases of the vertebral body, 4 cases of the tibia, 5 cases of rib, 3 cases of jaw and 1 case of sternum). The postoperative pathological classification of chondrosarcoma was grade I in 30 cases, grade II in 31 cases, grade III in 4 cases. According to Enneking clinical-stage system: stage I in 37 cases, stage II in 27 cases, stage III in 1 case. However, the Enneking stage system surgical treatment was determined, 6 cases were scraped intracapsular with curettage, 35 cases were marginal resection, 18 cases were wide resection, 6 cases were radical resection.

#### Observation indicators

The basic information (age, gender, ethnicity) and clinical characteristics (tumor site, surgical method, pathology grading, Enneking staging) of the patients were statistically described by reviewing medical records, and the postoperative recurrence of the patients was followed up by outpatient, ward, and telephone. All patients were followed up regularly for re-examination, and the changes of postoperative symptoms were known during the re-examination of case data. Computerized Tomography (CT), Magnetic Resonance Imaging (MRI) or PET-CT examination was performed. If necessary, a CT-guided puncture biopsy was performed. The recurrence cases were confirmed by at least 2 bone oncologists.

#### Statistical methods

Data analysis was performed using SPSS v20.0 statistical software. The log-rank test and Cox regression model were used to conduct a prime analysis of relevant indicators that may affect postoperative recurrence. Inspection level  $\alpha = 0.05$ .

#### RESULTS

The follow-up time of 65 patients with chondrosarcoma was 1-185 months, with an average follow-up of 35.4 months; 35 patients relapsed within 1-122 months after surgery, with an average recurrence time of 19.9 months and with a recurrence rate of 53.8%.

There was no correlation between age, gender, nationality, surgical method, pathological grade, and Enneking stage and postoperative recurrence ( $P > 0.05$ ), and tumor site and postoperative recurrence of chondrosarcoma ( $P < 0.05$ ) Table 1.

The postoperative recurrence rate of 25 cases of pelvic chondrosarcoma was 84.0% (21/25). The recurrence rate of 40 cases of non-pelvic chondrosarcoma was 35.0% (14/40), and the difference in postoperative recurrence rate between the two groups was statistically significant ( $P < 0.001$ ) Figure 1.

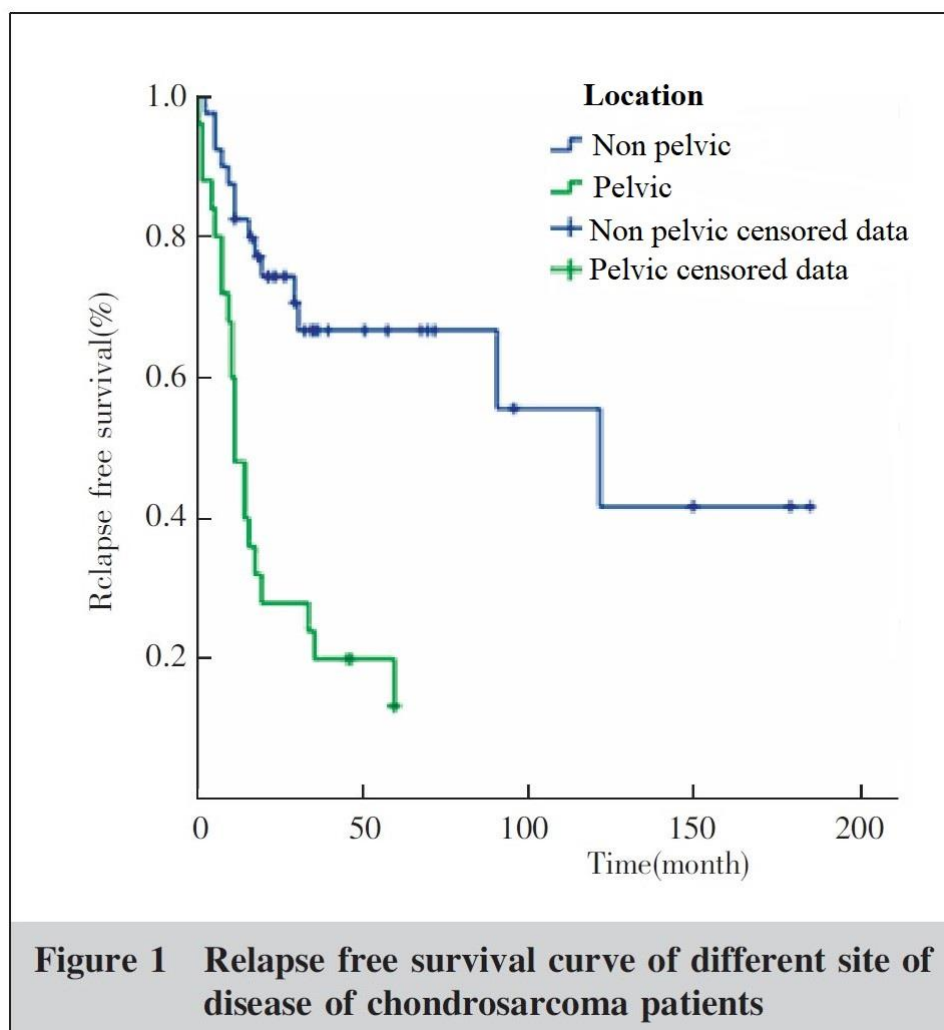
Cox regression model results showed that the site of tumor onset was an independent factor affecting postoperative recurrence ( $P = 0.007$ ), and the postoperative recurrence rate (RR) of pelvic chondrosarcoma was higher than that of non-pelvic chondrosarcoma (RR=3.610) Table 2.

**Table 1:** Relationship between postoperative recurrence of chondrosarcoma and various factors

Features	N	Recurrence %	No recurrence %	Log-rank $\chi^2$	P	
Gender	Male	37	24(64.9)	13(35.1)	3.51	0.061
	Female	28	11(39.3)	17(60.7)		
Location	Pelvic	32	21(84.0)	4(16.0)	17.605	<0.001
	Non pelvic	52	14(35.0)	26(65.0)		
Ethnic	Han	33	16(48.5)	17(51.5)	0.293	0.864
	Uyghur	16	10(62.5)	6(37.5)		
	Other	16	9(56.3)	7(43.8)		
Age (years old)	≤40	42	22(52.4)	20(47.6)	0.007	0.932
	>40	23	13(56.5)	10(43.5)		
Pathological grading	i	30	13(43.3)	17(56.7)	3.012	0.222
	ii	31	18(58.1)	13(41.9)		
	iii	4	4(100.0)	0		
Operation mode	Intracapsular curettage	6	3(50.0)	3(50.0)	3.449	0.327
	Marginal resection	35	22(62.9)	13(37.1)		
	Wide resection	18	8(44.4)	10(55.6)		
	Radical resection	6	2(33.3)	4(66.7)		
Enneking staging	1	37	17(45.9)	20(54.1)	3.149	0.076
	2~3	28	18(64.3)	10(35.6)		

**Table 2:** Multivariate analysis of postoperative recurrence of chondrosarcoma

Features	B	SE	Wald	P	RR	95%CI
Gender	-0.529	0.425	1.554	0.213	0.589	0.256~1.354
Age	0.309	0.402	0.59	0.443	1.362	0.619~2.997
<b>Ethnic</b>						
Han					1	
Uyghur	-0.389	0.464	0.7	0.403	0.678	0.273~1.684
Other	0.055	0.459	0.014	0.905	1.056	0.430~2.597
Location	1.284	0.475	7.307	0.007	3.61	1.423~9.155
<b>Pathological grading</b>						
I					1	
II	-0.181	0.55	0.108	0.742	0.835	0.284~2.450
III	0.585	0.86	0.462	0.497	1.794	0.332~9.688
<b>Operation mode</b>						
Intracapsular curettage					1	
Marginal resection	0.221	0.732	0.091	0.763	1.247	0.297~5.240
Wide resection	0.023	0.816	0.001	0.978	1.023	0.207~5.062
Radical resection	-0.052	1.119	0.002	0.963	0.949	0.106~8.506
Enneking staging	0.515	0.486	1.124	0.289	1.674	0.646~4.340



## DISCUSSION

Chondrosarcoma is a malignant connective tissue tumor characterized by the production of a cartilage matrix [2]. It is not sensitive to chemoradiotherapy, and surgical resection is the main treatment; Postoperative recurrence rate is high, malignant pathology progression is a major challenge to surgical treatment alone [3]. Therefore, it is of great significance to explore the risk factors of postoperative recurrence of chondrosarcoma for the selection of clinical treatment.

### *Effects of gender, ethnicity, and age on the postoperative recurrence of chondrosarcoma*

The results of this study showed no correlation between gender differences and postoperative recurrence of chondrosarcoma. Giuffrida *et al.* [4] found that the incidence of chondrosarcoma in the bone of the four limbs accounted for 60.9% in women and only 46.7% in men; suggesting that gender may be related to the site of chondrosarcoma, but not to postoperative recurrence. In this study, 65 cases of chondrosarcoma (33 cases of Han nationality, 16 cases of Uyghur nationality and 16 cases of other ethnic groups) were analyzed for postoperative recurrence, and there was no statistically significant difference in postoperative recurrence rate among the three groups. Giuffrida *et al.* [4] found in the study that the 30-year survival rate of elderly patients with chondrosarcoma was significantly lower than middle-aged and young patients, but did not clearly indicate the correlation between age and postoperative recurrence rate.

### *Effect of tumor location on the postoperative recurrence of chondrosarcoma*

Previous studies have shown that the location of chondrosarcoma affects postoperative recurrence. Pelvic chondrosarcoma is prone to invade the surrounding organs, and it is difficult to achieve wide resection during surgery. After multiple marginal resections are performed, and the tumor cells may remain on the cutting edge and may easily lead to postoperative recurrence. In contrast, non-pelvic extremity chondrosarcoma is more likely to reach the surgical boundary. Such as the analysis of the recurrence of pelvic chondrosarcoma factors points out that due to deep parts of pelvic chondrosarcoma, slow growth, and clinical symptoms appear relatively late, it is difficult to early detection, serious invasion of adjacent organs and soft tissue operation is difficult, reconstruction is difficult, difficult to obtain satisfactory surgical boundary. Fiorenza *et al.* [5] analyzed the postoperative recurrence of 153 patients with chondrosarcoma and found that the recurrence rate of pelvic tumors was 32% and non-pelvic tumors were 23%. In this study, the recurrence rate of pelvic chondrosarcoma was 84.0% and non-pelvic chondrosarcoma was 35.0%, with statistically significant differences. Cox regression model analysis showed that the postoperative recurrence rate of pelvic chondrosarcoma was higher than non-pelvic chondrosarcoma (RR=3.610). Therefore, we should pay special attention to the surgical treatment of pelvic chondrosarcoma in our clinical study and a satisfactory surgical boundary is an important factor for the prevention of postoperative recurrence of chondrosarcoma.

### *Correlation between pathological factors and postoperative recurrence of chondrosarcoma*

The most commonly used pathological classification of chondrosarcoma in the world is 2013 WHO classification of bone and soft tissue tumors [6]. The three-level classification method represented by Bogdan C [7], which is comprehensively evaluated after the degree of evaluation according to the following items, respectively, divides chondrosarcomas into grades I, II, and III: ① richness of chondrocytes; ② abnormality of chondrocytes; ③ presence and absence of binuclear cells and mitotic

figures; ④ presence and extent of mucoid degeneration of cartilage matrix. Donati *et al.* [8] study closely related to its pathological grading, chondrosarcoma postoperative recurrence in the follow-up of patients with 124 cases of chondrosarcoma found that chondrosarcoma grade I postoperative recurrence rate is only 13%, grade II is 18%, grade III is 28%. Bjornsson *et al.* [9] studied the correlation between tumor pathological grade and postoperative recurrence rate in 223 patients with chondrosarcoma and found that the recurrence rate of low-grade malignant (grade I) tumors was significantly lower than moderate-high grade (grade II or III) Tumor. Fiorenza *et al.* [5] reported 153 cases of chondrosarcoma grade I recurrence rate was 21.1%, the grade II recurrence rate was 27.4%, the grade III recurrence rate was 46.7%. With the increase of histological grade of chondrosarcoma, the tumor recurrence rate is getting higher and higher. Relevant studies have shown that [10] grade I surgery can choose intracapsular curettage or marginal resection similar to benign tumors, which has fewer complications and better functional prognosis, and the risk of recurrence and metastasis is not significantly increased. Incidence of chondrosarcoma grade I recurrence rate was 43.3%, the grade II recurrence rate was 58.1%, the grade III recurrence rate was 100.0%; the grade III postoperative recurrence rate is significantly higher than chondrosarcoma grade I and chondrosarcoma grade II. The results of this study are inconsistent with the above reports. The possible reasons are: firstly, the data volume of this study is relatively small; Second, it may be because the time span of medical records collected is large and long (15 years), so the medical conditions vary greatly; The third reason may be that there are more radical operations for tumors with higher grade and malignant degree.

### *Effect of Enneking stage and surgical method on the postoperative recurrence of chondrosarcoma*

In clinical work, the selection of surgical methods is mainly based on Enneking staging and classification [11]. Intracapsular resection, or intracapsular curettage, refers to scraping the tumor in the long bone marrow cavity and then supplementing it with phenol to kill the tumor cells; In the surgical treatment of chondrosarcoma, this method is only used in patients with Stage I. Marginal resection refers to the complete resection of the tumor and its outer membrane; The surgical boundary is the reaction zone around the tumor; Since the growth of malignant tumor cells can enter the reaction zone, small tumor lesions may remain on the resection edge. Wide resection refers to the complete resection of tumor tissues and surrounding normal tissues in the compartment, with more than 2 cm outside the tumor reaction zone. Radical resection refers to the complete resection of the entire compartment, including tumor tissue, muscle, blood vessels, and nerves, outside the compartment. Intracapsular and marginal resections are referred to as inadequate surgery and wide and radical resections are referred to as adequate surgery. Fiorenza *et al.* [5] studied the operation and postoperative conditions of 153 patients with chondrosarcoma and found that only 5 of the 70 patients with adequate surgery had recurrence, with a recurrence rate of 7%; while 83 patients with inadequate surgery had a recurrence rate of 42%, showing statistically significant differences between the two groups. Therefore, the safe surgical boundary is an important factor to reduce the local recurrence rate of chondrosarcoma. In this study, the recurrence rate of tumor intracapsular curettage was 50.0%, marginal resection was 62.9%, wide resection was 44.4%, and radical resection was 33.3%. This study found that the tumor growth site is an independent influencing factor for the postoperative recurrence of chondrosarcoma. There was a significant difference in the postoperative recurrence rate between pelvic chondrosarcoma and non-pelvic chondrosarcoma, and patients with chondrosarcoma in the pelvic had 3.610 times higher risk of postoperative recurrence than those with the non-pelvic tumor.

## CONCLUSION

The local recurrence rate after surgical resection of pelvic chondrosarcoma was significantly higher than other chondrosarcomas. Therefore, clinically more attention should be paid to the surgical boundary of chondrosarcoma, especially for pelvic chondrosarcoma to completely remove the tumor and its margin area. If necessary, adjuvant or chemotherapy can be performed according to the pathological grading of the tumor to reduce the postoperative recurrence rate. Analysis of the difference between surgical techniques, clinical Characteristics, prognostic factors, and patient outcomes has been limited because of the rarity of these lesions and few institutions having enough patients to study about it.

## Ethical approval

The ethics committee approved this manuscript and design plan.

## Statement of Informed Consent

No consent was needed because the database is publicly available and does not include unique patient identifiers.

## Availability of data and materials

By reasonable request, the author will provide data.

## Authors' contributions

SAJ & SJ conceived and designed the study; SAJ, BSR, LCH, and MMST collected the data for analysis; SAJ, BSR & LCH checkout the follow-up; SAJ & BSR wrote different parts of the manuscript; SJ revised the manuscript.

## Conflicts of interest

The authors declare no conflicts of interest.

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None.

## REFERENCES

1. Chen Y, Wang X, Guo L, et al. Radiological features and pathology of extraskeletal mesenchymal chondrosarcoma. *Clinical imaging*. 2012;36(4):365-370.
2. Rozeman LB, Hogendoorn PC, Bovée JV. Diagnosis and prognosis of chondrosarcoma of bone. Expert review of molecular diagnostics. 2002;2(5):461-472.
3. Weber KL, Pring ME, Sim FH. Treatment and outcome of recurrent pelvic chondrosarcoma. *Clinical Orthopaedics and Related Research*<sup>®</sup>. 2002;397:19-28.
4. Giuffrida AY, Burgueno JE, Koniaris LG, Gutierrez JC, Duncan R, Scully SP. Chondrosarcoma in the United States (1973 to 2003): an analysis of 2890 cases from the SEER database. *JBJS*. 2009;91(5):1063-1072.
5. Fiorenza F, Abudu A, Grimer R, et al. Risk factors for survival and local control in chondrosarcoma of bone. *The Journal of bone and joint surgery British volume*. 2002;84(1):93-99.
6. Fletcher CD, Bridge JA, Hogendoorn PC, et al. WHO Classification of Tumours of Soft Tissue and Bone [M]. Lyon : Springer, 2013, 46(2) : 95-104.
7. Czerniak B. *Dorfman and Czerniak's Bone Tumors*. 2016.
8. Donati D, Ghoneimy AE, Bertoni F, Di Bella C, Mercuri M. Surgical treatment and outcome of conventional pelvic chondrosarcoma. *The Journal of bone and joint surgery British volume*. 2005;87(11):1527-1530.
9. Björnsson J, McLeod RA, Unni KK, Ilstrup DM, Pritchard DJ. Primary chondrosarcoma of long bones and limb girdles. *Cancer*:

- Interdisciplinary International Journal of the American Cancer Society. 1998;83(10):2105-2119.
10. Chen X, Yu L, Peng H, et al. Is intralesional resection suitable for central grade 1 chondrosarcoma: a systematic review and updated meta-analysis. *European Journal of Surgical Oncology*. 2017;43(9):1718-1726.
  11. Enneking WF, Spanier SS, Goodman MA. The classic: A system for the surgical staging of musculoskeletal sarcoma. *Clinical Orthopaedics and Related Research*<sup>®</sup>. 2003;415:4-18.