



# Lymphovascular invasion and histopathologic profile portends worse prognosis in chondrosarcoma

Alexander Lazarides MD, Bijan Abar, Bruce Leckey DO, Will Eward DVM, MD, Brian Brigman MD, PhD Diana Cardona MD, Julia Visgauss MD  
Duke University Medical Center, Durham, NC



## Background

- Despite being the second most common primary bone cancer, chondrosarcoma remains a diagnostic and treatment challenge.
- To date, prognostic factors such as age, grade, location, margin status and tumor size have been associated with survival.
- The histopathologic features that are most associated with survival have not been well established.

## Purpose

- The goal of this study was to identify histopathologic features of chondrosarcoma that are most associated with survival
- A sub-aim was to compare these to traditional patient, tumor and treatment variables.

## Methods

- We retrospectively reviewed all patients undergoing surgical resection of a primary chondrosarcoma at a single tertiary care referral center from 2006-2018.
- Patients were included if they had at least 2 years of follow up available. Patients were excluded with insufficient follow up, secondary malignancies and incomplete treatment details.
- We performed Kaplan Meier analyses to identify the factors associated with overall survival and disease-free survival in univariate measures.
- A Cox Proportional Hazards analysis was then used to identify factors independently associated with overall 5-year survival (OS) and 5-year disease free survival (DFS).

## Results

- 81 patients with an average follow up of 52.9 months were eligible for inclusion.
- 25 tumors (30.9%) were low grade, 36 tumors (44.4%) were intermediate grade and 20 tumors (24.7%) were high grade.
- 18 patients (22.2%) had a local recurrence; 25 patients (30.9%) developed metastatic disease.

## Results

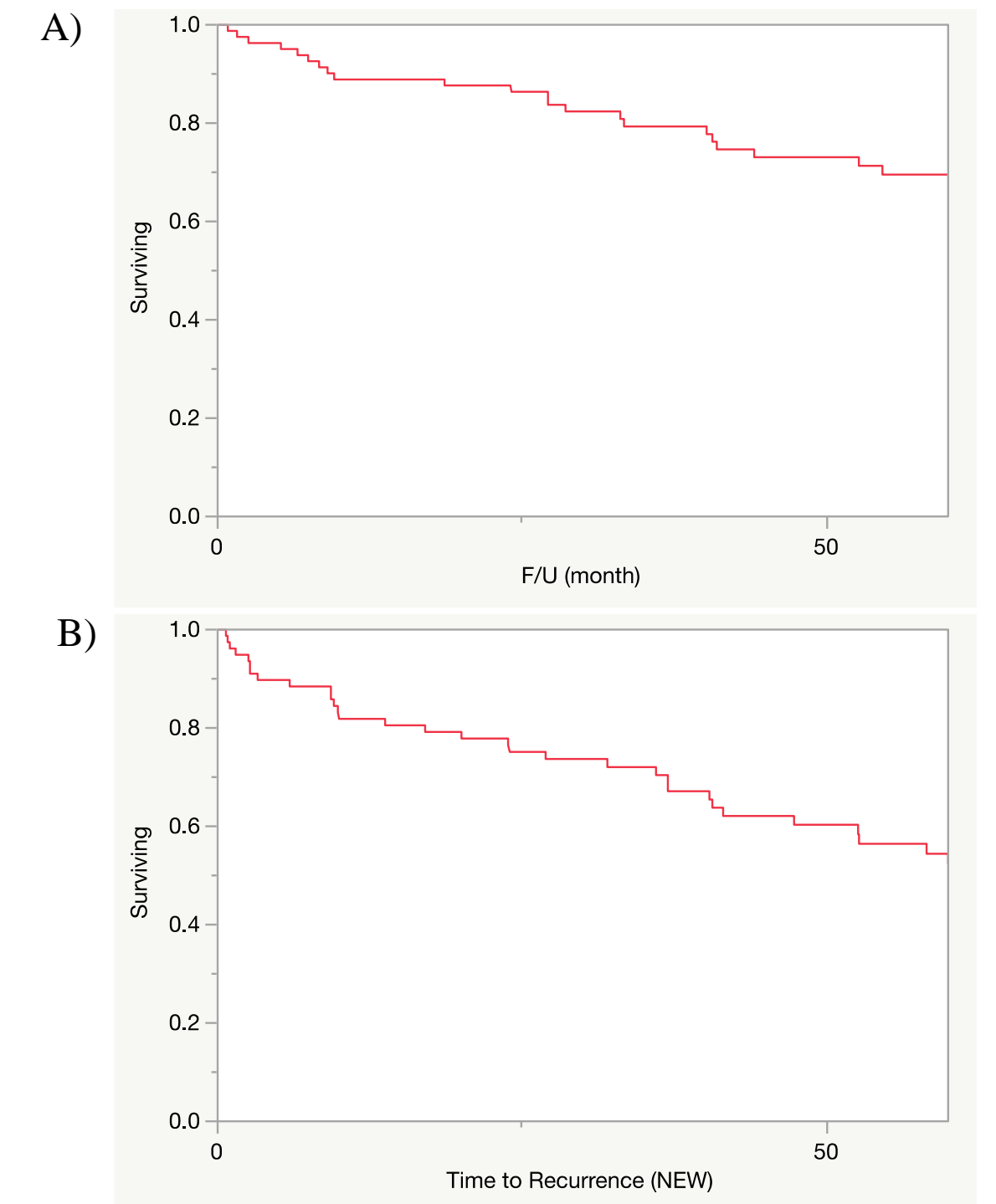
**Table 1: Univariate analysis of association of patient characteristics with 5-year RFS and OS**

Parameter	n	5-y OS (%)	p	5-y RFS (%)	p
Age				0.08	0.02
Old (>50 yrs)		63.4		45.9	
Young (<50 yrs)		82.9		64.4	
Sex			0.42		0.14
Male		60.8		38.3	
Female		79.8		71.5	
Race			0.67		0.48
Caucasian					
African American					
Other					
Site			0.18		0.19
Chest		87.5		70.4	
Extremity		68.3		58	
Pelvis		60.1		30.5	

**Table 2: Univariate analysis of association of disease characteristics with 5-year RFS and OS**

Parameter	n	5-y OS (%)	p	5-y RFS (%)	p
Tumor size				0.12	0.01
<8		78.9		68.5	
>8		64.7		39.3	
Histological Subtype			0.002		<0.001
Dediff	35			21.4	
CSA	76.4			61.5	
Grade			0.001		<0.001
Low		91.2		84.9	
Intermediate		69.7		48	
High		42.9		21	
Margins			0.014		0.23
Negative	75			55	
Positive	50.9			50.9	
RT?			0.94		0.12
Yes	71.8			40	
No	67.8			54	
Chemo?			0.14		<0.001
Yes	53.8			15	
No	76.5			69.9	
Recurrence			0.02		
Yes	53.5				
No	85.3				
Path Factors					
% Necrosis					
Cellularity			0.005		<0.001
Atypia			0.005		<0.001
Necrosis			0.17		0.44
Mitosis			0.02		0.004
Lymphovascular invasion			0.005		0.02
Dedifferentiation			<0.001		<0.001
Myxoid Component			0.94		0.99

## Results cont'd



**Figure 1: A) The 5-year OS for the cohort as a whole was 69.6%, B) while the 5-year DFS for the cohort as a whole was 40.7%.**

### Predictors of Survival:

A MV analysis investigating the independent association of pathologic factors with OS and DFS, **lymphovascular invasion was associated with worse OS and DFS** (HR 6.6, p=0.044 and HR 6.5, p=0.041 respectively), even when controlling for tumor grade.

## Conclusion

- Predicting the clinical course for chondrosarcoma remains a challenge; there is a need for better predictive tools to help inform physicians and counsel patients with regard to prognosis.
- This study identified an array of pathologic factors used to assess grade that are associated with survival
- Independent of grade, lymphovascular invasion in particular is independently associated with OS and DFS and should be considered in the pathologic evaluation of these patients.