

Lesion Size as a Predictor of Non-Operative Therapy Failure in Juvenile Osteochondritis Dissecans of the Knee

Introduction

Juvenile Osteochondritis Dissecans (JOCD) is a disorder affecting the subchondral bone in skeletally immature patients. Treatment for JOCD involves either non-operative therapy (consisting of joint immobilization, bracing, or activity restriction), or operative fixation of the lesion. While increased lesion size and advanced age have been associated with higher rates of non-operative therapy failure, there are no definitive non-operative treatment criteria for stable lesions. Overall, the primary challenge in JOCD of the knee management lies in the difficulty of predicting who will fail conservative management and require surgical referral.

Research Question

Do lesion size, knee size, patient age, and type of immobilization employed in the non-operative treatment of JOCD of the knee provide guidance on the healing potential of the non-operative patient?

The primary outcome of this study was to evaluate the predictive nature of the lesion size, and to determine a lesion size cutoff point beyond which a patient’s likelihood of successful non-operative therapy significantly declines.

Materials and Methods

This retrospective case control study identified 36 knees between 2008 -2018 that met the inclusion criteria of stable JOCD lesions that received a 3-month non-operative therapy treatment consisting of either unloader bracing and/or activity restriction. The primary outcome of interest was improved clinical status at three months with accompanying MRI evidence of reossification. Continuous and categorical variables including lesion size were analyzed using logistic regression. Normalized length, normalized width, and scaled surface area were determined by measuring the maximal length and width of the femoral condyles and calculating the lesion as a percentage of that corresponding measurement.



Coronal view with measurements of JOCD lesion and femoral condyle widths

Sagittal view with measurements of JOCD lesion and femoral condyle lengths

Table 1:	Overall	No Surgery	Surgery	P-value
	N=36	N=23	N=13	
Age at start of Tx (mean, SD)	11.1 (2.06)	10.4 (2.10)	12.4 (1.18)	0.002
Sex (male, %)	23 (63.9)	13 (56.5)	10 (76.9)	0.29
Multiple MRI (yes, %)	9 (25.0)	4 (17.4)	5 (38.5)	0.23
Affected Knee (right, %)	18 (50.0)	12 (52.2)	6 (46.2)	1
Location (lateral, %)	6 (16.7)	4 (17.4)	2 (15.4)	1
Type of Immobilization (brace, %)	20 (55.6)	12 (52.2)	8 (61.5)	0.59
Lesion Length, mm (mean, SD)	16.6 (55.5)	15.4 (4.43)	18.5 (4.19)	0.06
Lesion Width, mm (mean, SD)	12.3 (3.23)	11.3 (3.14)	14.0 (2.74)	0.006
Lesion Depth, mm (mean, SD)	4.33 (1.14)	4.13 (1.18)	4.69 (1.03)	0.11
Lesion Surface Area, mm ² (mean, SD)	214.5 (107.1)	185.0 (103.7)	266.6 (95.5)	0.01
Normalized Length % (mean, SD)	35.2 (10.4)	33.1 (10.2)	38.9 (10.0)	0.08
Normalized Width % (mean, SD)	46.9 (11.7)	43.8 (11.7)	52.6 (9.59)	0.03
Scaled Surface Area % (mean, SD)	17.4 (8.68)	15.3 (8.11)	21.2 (8.65)	0.03

Table 2:	No Surgery N=23	Surgery N=13	OR (95% CI)	P-value
	N, %	N, %		
Lesion Length, mm (>18)	7 (30.4)	10 (76.9)	5.87 (1.02, 33.6)	0.047
Lesion Width, mm (>14)	5 (21.7)	9 (69.2)	5.70 (1.04, 31.3)	0.045
Lesion Depth, mm (>4)	18 (78.3)	12 (92.3)	10.7 (0.62, 183.2)	0.1
Lesion Surface Area, mm ² (>250)	4 (17.4)	9 (69.2)	6.84 (1.17, 39.8)	0.032
Normalized Length, mm (>40)	4 (17.4)	6 (46.2)	2.66 (0.46, 15.4)	0.27
Normalized Width, mm (>50)	7 (30.4)	9 (69.2)	6.39 (1.01, 40.5)	0.049
Scaled Surface Area, mm ² (>20)	5 (21.7)	7 (53.8)	3.96 (0.72, 21.9)	0.12

Results

Following 3 months of non-operative treatment, 23 of the 36 knees (64%) had progression toward healing. The mean starting age of the patients with lesions that progressed toward healing was 10.4 years +/- 2.10 years and the mean age that required surgical referral was 12.4 years +/- 1.18 years (p = 0.002). The mean surface area of the lesions that demonstrated progression toward healing was 185.0mm² +/- 103.7mm², and the mean surface area of the lesions that did not progress toward healing and were referred for surgical management was 266.6mm² +/- 95.5mm² (p = 0.01). The mean lesion surface area cutoff point > 250mm² contained 13 knees. Of these 13 knees, 4 progressed toward healing (17.4% of the healing group), while 9 required surgical referral (69.2% of the surgery group) (OR = 6.84, 95% CI [1.17,39.8], p = 0.032). Normalized measurement of lesion length, and scaled measurement of surface area did not increase predictive power over non-normalized or non-scaled measurements.

Conclusion

We conclude that advanced age and increased lesion size are the primary determinates of outcome in non-operative JOCD therapy. For JOCD patients with a stable lesion surface area of >250mm², our data suggests a 6.84 times greater risk for failure of non-operative therapy versus lesions smaller than that cut point. We suggest that stable lesions with a mean surface area that is >250mm² are at an increased risk for non-operative failure and should be considered for a direct surgical referral.

Summary

- There are no definitive non-operative treatment criteria in JOCD of the knee
- Increased lesion size and advanced age were the strongest predictors of JOCD non-operative therapy failure
- Stable lesions with a mean surface area that is >250mm² are at an increased risk for non-operative failure and should be considered for direct surgical referral
- Determining the correct treatment regimen from the initial visit is imperative to ensuring children return to their active lifestyles as quickly as possible

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