BONE BRUISE
DİZ OSTEONEKROZU

DR. EMİN BAL

Kemik İliği Lezyonları ve Subkondral Kemik Hastalığı

- Travmatik kontüzyonlar
- Kıkırdak cerrahisi sonrası
- Osteoartrit
- Geçici BML Sendromları
- Subkondral Yetmezlik kırıkları
- Osteonekroz

Knee Surg Sports Traumatol Arthrosc (2016) 24:1797–1814
DOI 10.1007/s00167-016-4113-2

KNEE

Bone marrow lesions and subchondral bone pathology of the knee

Elizaveta Kon[1,2] · Mario Ronga[3] · Giuseppe Filardo[1] · Jack Farr[4] · Henning Madry[5] · Giuseppe Milano[6] · Luca Andriolo[1] · Nogah Shabshin[7,8]

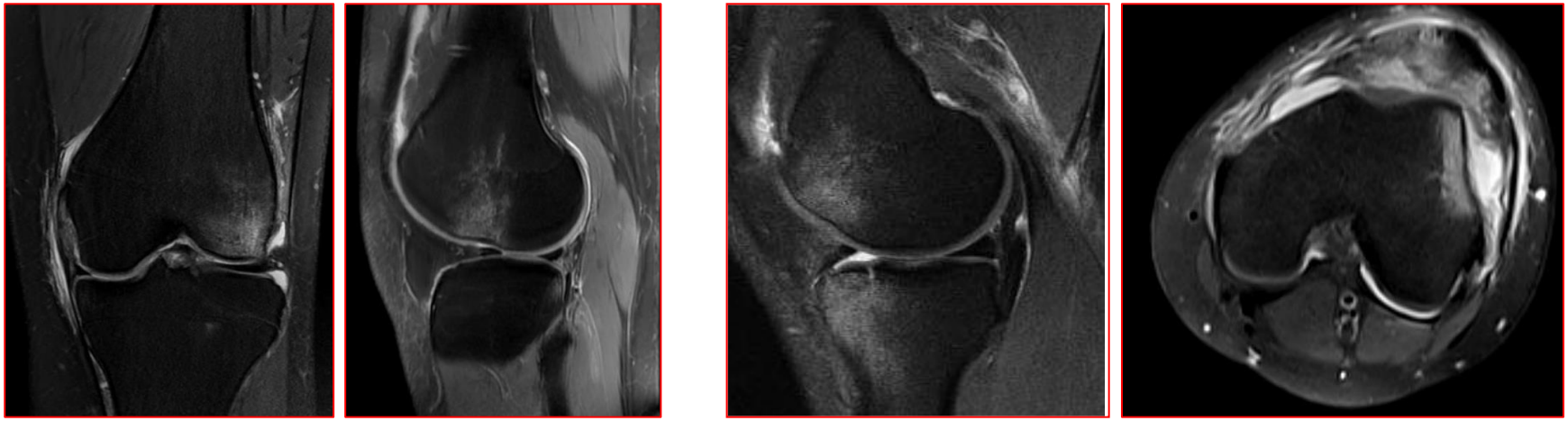
Kemik İliği Lezyonları (BML)

- Travmatik
- Non-Travmatik

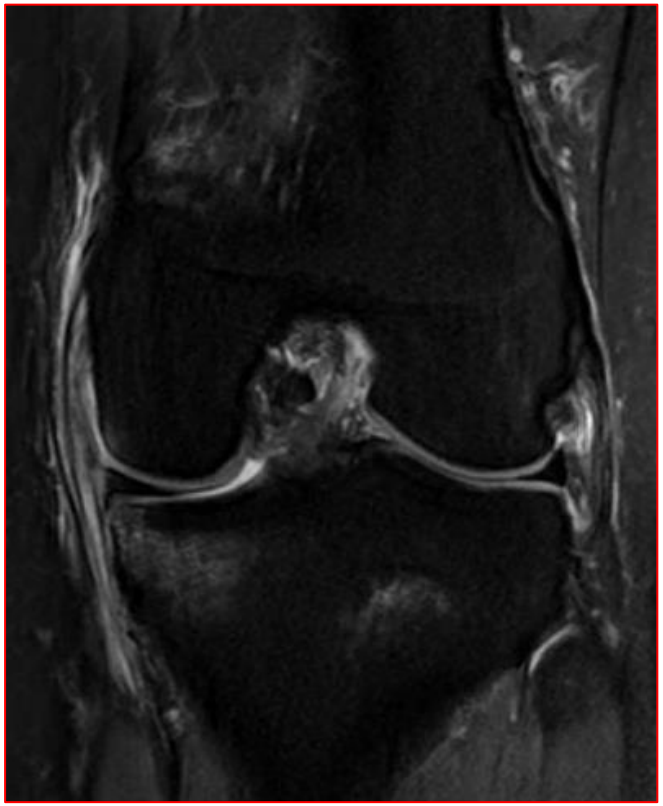
- Reversible
- Non-Reversible

Travmatik BML

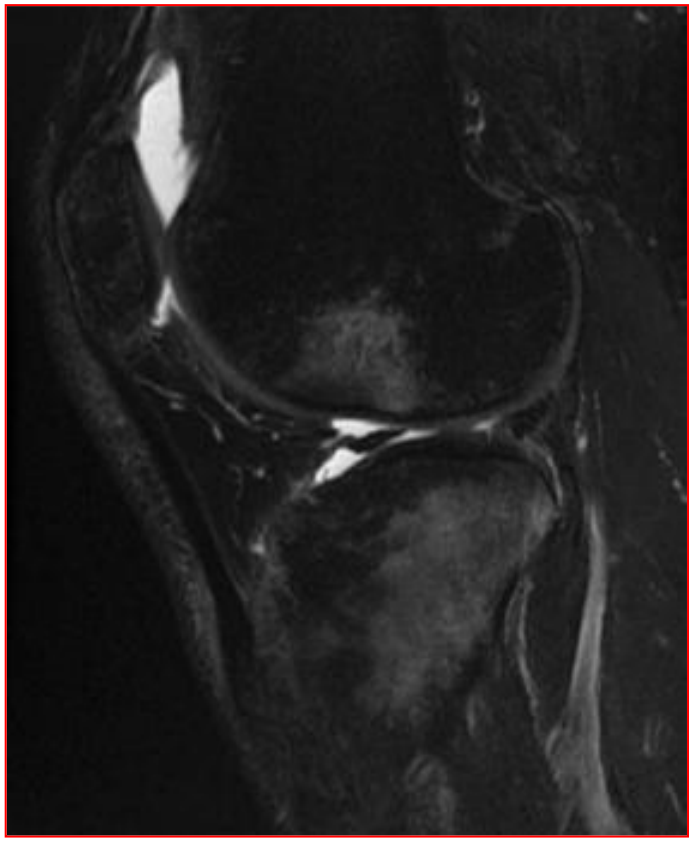
- Akut Direek/İndirek
- Tekrarlayan mikrotravmalar



Travmatik BML



Travmatik BML



Knee Surgery, Sports Traumatology, Arthroscopy
https://doi.org/10.1007/s00167-019-05599-9

KNEE

Lateral meniscus posterior root tear in anterior cruciate ligament injury can be detected using MRI-specific signs in combination but not individually

Kazuki Asai[1] · Junsuke Nakase[1] · Takeshi Oshima[1] · Kengo Shimozaki[1] · Kazu Toyooka[1] · Hiroyuki Tsuchiya[1]

Received: 30 January 2019 / Accepted: 24 June 2019

LM yırtığı olanların %87'sinde lateral kompartman bone bruise

Knee Surg Sports Traumatol Arthrosc
DOI 10.1007/s00167-013-2657-y

KNEE

Relationship between bone bruise volume and the presence of meniscal tears in acute anterior cruciate ligament rupture

Kenneth D. Illingworth · Daniel Hensler · Bethany Casagranda · Camilo Borrero · Carola F. van Eck · Freddie H. Fu

Femoral bone bruise genişliği meniskal yırtıklar ile ilişkilidir

Travmatik BML

Location of Bone Bruises and Other Osseous Injuries Associated With Acute Grade III Isolated and Combined Posterolateral Knee Injuries
Andrew G. Geeslin and Robert F. LaPrade
Am J Sports Med 2010 38: 2502 originally published online September 13, 2010
DOI: 10.1177/0363546510376232

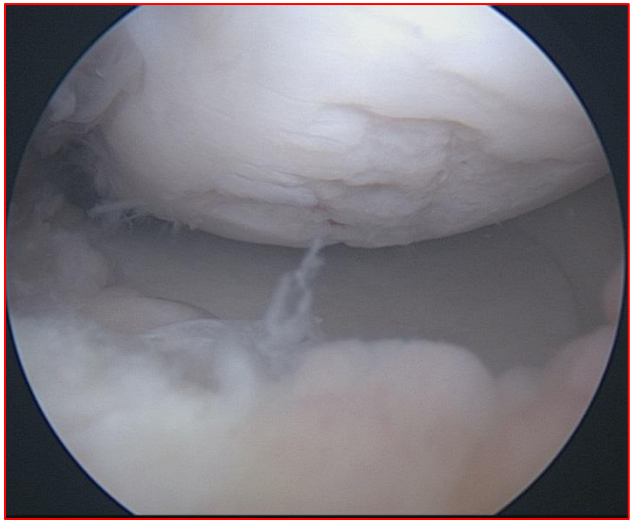
Femur ve Tibia Anteromedial «kissing» kemik kontüzyonlarında PLK yaralanmasına dikkat ***

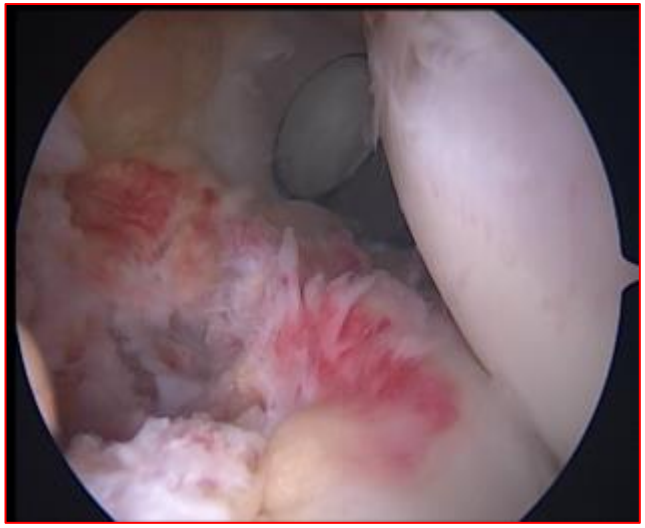
Travmatik BML

Incidence and Detection of Meniscal Ramp Lesions on Magnetic Resonance Imaging in Patients With Anterior Cruciate Ligament Reconstruction

Nicholas N. DePhillipo,* MS, ATC, OTC, Mark E. Cinque,† MS, Jorge Chahla,† MD, PhD, Andrew G. Geeslin,*† MD, Lars Engebretsen,‡ MD, PhD, and Robert F. LaPrade,*†§ MD, PhD
Investigation performed at The Steadman Clinic, Vail, Colorado, USA

RAMP lezyonlarının
%72'sinde
Anteromedial Femur
Posteromedial Tibia

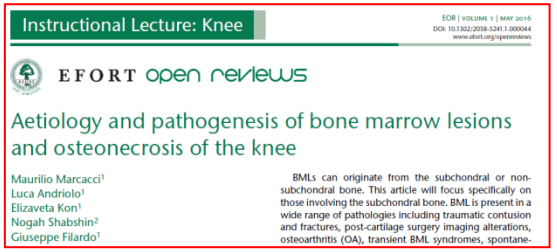




Travmatik BML

Histopatoloji

- Subkondral kemikte impaksiyon, spongiozada mikrokırık, hemoraji ve ödem
- Subkondral kırık, eklem yüzeyinde çökme ve kollaps
- Subkondral kemik iyileşmesi ve skleroz, üzerindeki kıkırdağın incelmesi, osteokondral ya da kondral defekt şeklinde sekel
- Yaralı bölgede kondrosit apopitozu, kondrosit nekrozu, superfisyal proteoglikan kaybı



Travmatik BML

Doğal Seyir

Knee Surg Sports Traumatol Arthrosc (2006) 14:1252–1258
DOI 10.1007/s00167-006-0087-9

KNEE

Natural history of bone bruises after acute knee injury: clinical outcome and histopathological findings

Atsuo Nakamae · Lars Engebretsen ·
Roald Bahr · Tron Krosshaug · Mitsuo Ochi

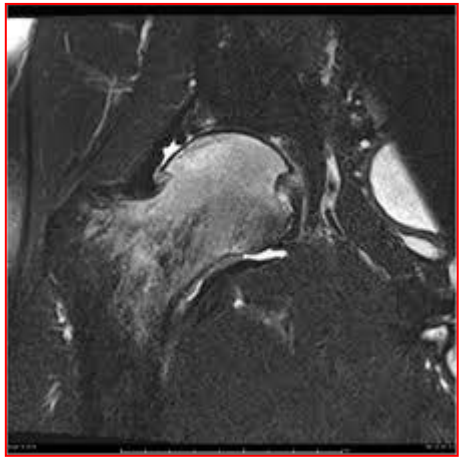
- Geniş BML iyileşmesi uzun
- Bazen irrevesible (Başarılı rekonst. rağmen)
- Kıkırdak homeostazisi uzun süre düzelmiyor

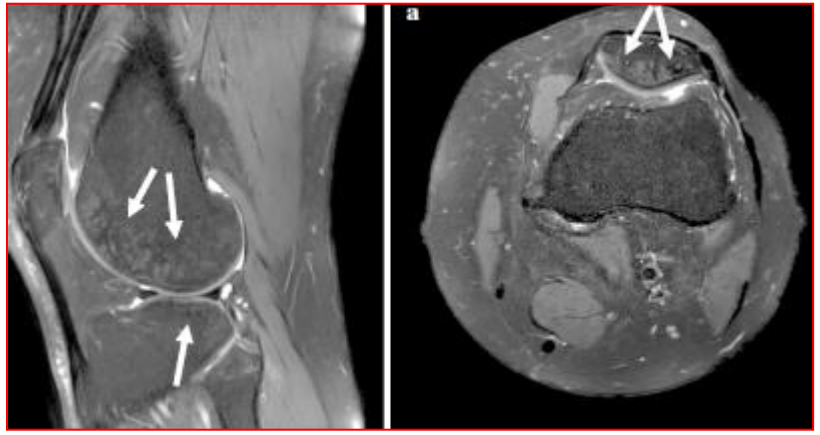
Geniş ve eklem yüzeyine yakın BML ve subkonral yaralanmalar geç dönem osteoartrit gelişim habercisi

Postoperatif rehabilitasyonda agresif yaklaşımlardan uzaklaşılmalı

Transient BML

- Transient Osteoproz (TOP)
- Transient Migratuar Osteoporoz (TMOP)
- Kompleks Bölgesel Ağrı Send (CRPS)





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Osteoartritte BML

- Aşırı yük aktarımının neden olduğu mikrotravmalar
- Ekstremite dizilimi önemli
- Meniskal patolojiler
- Etyoloji; yük binen bölgedeki venöz staz intraossöz basıncı arttırıyor ve kemik kanlanmasını bozarak kemik iliği ödemine yolaçıyor.

Schweitzer ME, White LM (1996) Does altered biomechanics cause marrow edema? Radiology 198(3):851–853

Manara M, Varenna M (2014) A clinical overview of bone marrow edema. Reumatismo 66(2):184–196

Osteoartritte BML

Prognozu ?

Roemer (2009) Multicenter; Çoğunluğu 30 ayda geriler ya da kaybolur

Kornaat (2007) Dutch; Sadece %20'si 2 yılda azalır ya da kaybolur

Hunter (2006) Boston; Sadece %1'inden azında 30 ayda azalma

Osteoartritte BML

Prognozu ?

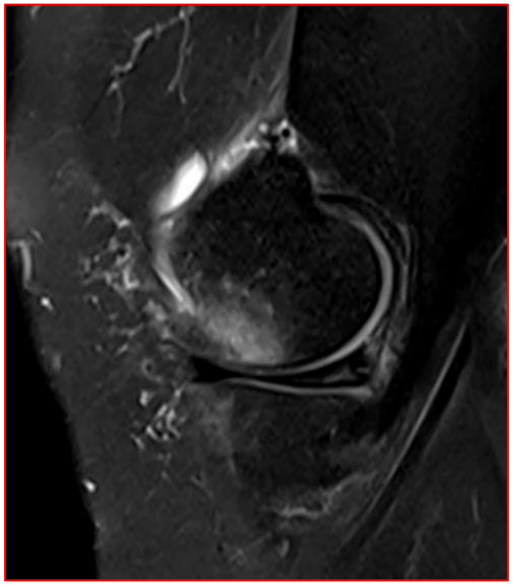
Roemer (2009) Multicenter; Genişleme gösteren hastalarda kıkırdak kaybı, ağrı ve devamında artroplastiye gidiş açısından negatif prognostik faktör

Tanamas (2010); Ciddi BML olanların 4 yıl içinde artroplastiye gitme riski yüksek

Scher (2008); BML olan osteoartritli olguların hızla artroplastiye gitme oranları 8,95 kat fazla

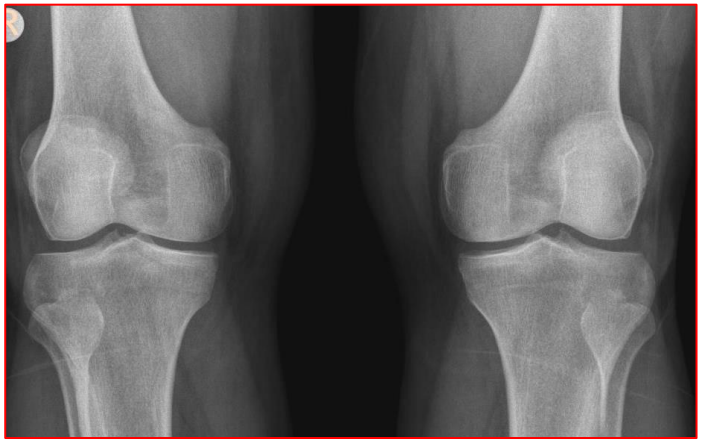
Osteoartritte BML

53 y Kadın
3 aydır sağ diz ağrısı
Kütleme sesi sonrası
BMI:28

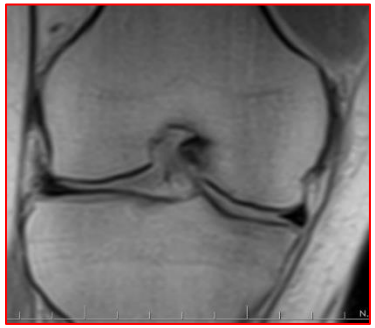


Osteoartritte BML

57 y Erkek
1,5 aydır sağ diz ağrısı
BMI:26








OSTEONEKROZ

Kemik dokusunun nekrozu ile seyreden ve ileri evre osteoartrit ile sonuçlanan bir hastalık

- Spontan (Primer) Osteonekroz (SONK)
- Sekonder Osteonekroz
- Post-artroskopik Osteonekroz

SPONTAN OSTEONEKROZ (SONK)

Klinik

- 60 Yaş üzeri, obez kadınlarda sık
- Genelde tek taraf tutulum
- MFK sıklıkla
- Ani başlayan, şiddetli ağrı (öz. gece)
- Yüklenme ile ağrıda artış

SPONTAN OSTEONEKROZ (SONK)

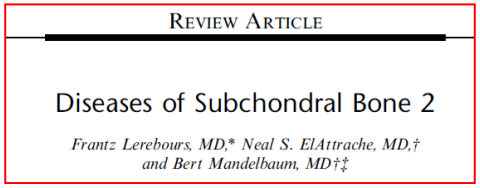
Etyopatogenez

- Vasküler Teori

Subkondral kemikte mikrosirkülasyon boz … intraossöz ödem … perfüzyon bozulması … FOKAL İSKEMİ

- Subkondral yetmezlik kırığı teorisi

Osteopenik kemikte oluşan kırıklar … sinovyal sıvı infiltrasyonu … kemikiçi ödem ve fokal iskemi … kırık iyileşmesinin bozulması … fragmantasyon ve fragmanın ayrılması … bağlantısız fragmanlarda nekroz oluşumu


REVIEW ARTICLE

Diseases of Subchondral Bone 2

Frantz Lerebours, MD, Neal S. ElAttrache, MD,† and Bert Mandelbaum, MD†‡*


Review Article

Page 1 of 11

Osteonecrosis of the knee: review

Ammar R. Karim[1], Jeffrey J. Cherian[2], Julio J. Jauregui[2], Todd Pierce[2], Michael A. Mont[2]

[1]Rowan University, School of Osteopathic Medicine, Stratford, NJ, USA; [2]Rubin Institute for Advanced Orthopedics, Center for Joint Preservation and Reconstruction, Sinai Hospital of Baltimore, Baltimore, MD, USA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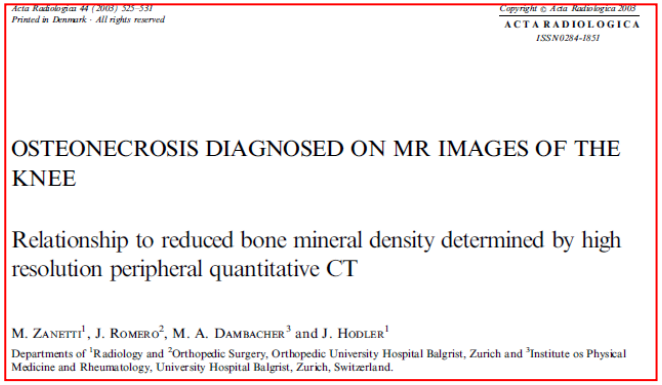
SPONTAN OSTEONEKROZ (SONK)

Etyopatogenez

- Kemik Dansite azlığı yetmezlik kırıklarına ve dolayısıyla SONK'a yolaçabilir.



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OSTEONECROSIS DIAGNOSED ON MR IMAGES OF THE KNEE

Relationship to reduced bone mineral density determined by high resolution peripheral quantitative CT

M. ZANETTI[1], J. ROMERO[2], M. A. DAMBACHER[3] and J. HODLER[1]

Departments of [1]Radiology and [2]Orthopedic Surgery, Orthopedic University Hospital Balgrist, Zurich and [3]Institute os Physical Medicine and Rheumatology, University Hospital Balgrist, Zurich, Switzerland.

Acta Orthopaedica 2012; 83 (3): 249–255

Low bone mineral density is associated with the onset of spontaneous osteonecrosis of the knee

Yasushi Akamatsu[1,2], Naoto Mitsugi[1], Takeshi Hayashi[1], Hideo Kobayashi[1], and Tomoyuki Saito[2]

[1]Department of Orthopaedic Surgery, Yokohama City University Medical Center; [2]Department of Orthopaedic Surgery, Yokohama City University School of Medicine, Yokohama City, Kanagawa, Japan.

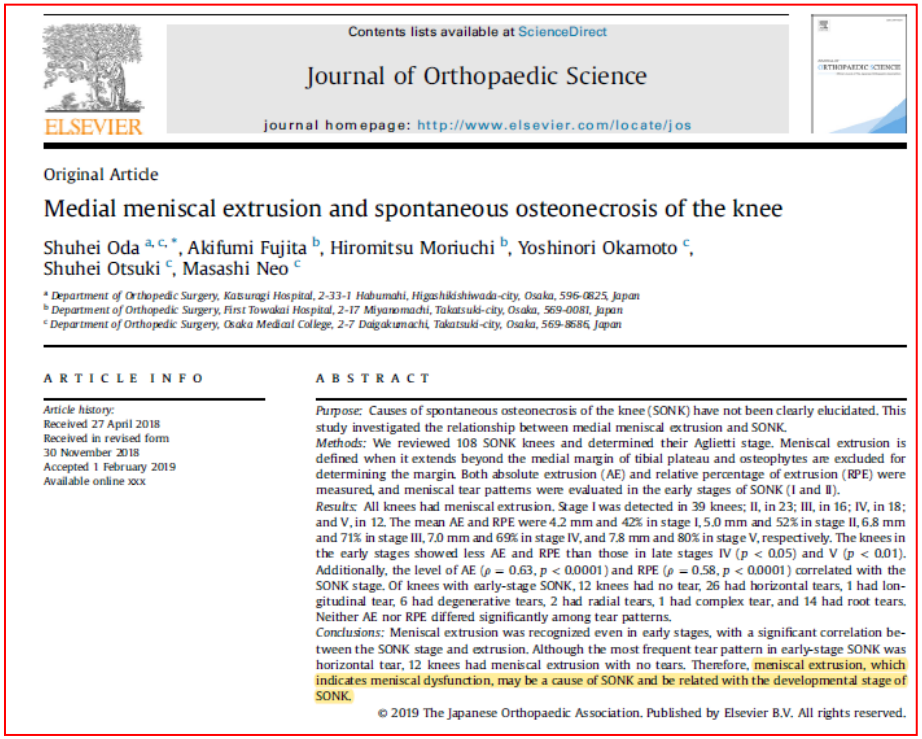
SPONTAN OSTEONEKROZ (SONK)

Etyopatogenez

- Menisküs kök yırtıkları da SONK'a neden olabilir

Robertson DD, Armfield DR, Towers JD, et al. Meniscal root injury and spontaneous osteonecrosis of the knee: an observation. *J Bone Joint Surg Br*. 2009;91:190–195.

Yasuda T, Ota S, Fujita S, Onishi E, Iwaki K, Yamamoto H. Association between medial meniscus extrusion and spontaneous osteonecrosis of the knee. Int J Rheum Dis 2018 Dec;21(12):2104e11.



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Journal of Orthopaedic Science

journal homepage: http://www.elsevier.com/locate/jos

Original Article

Medial meniscal extrusion and spontaneous osteonecrosis of the knee

Shuhei Oda [a, c, *], Akifumi Fujita [b], Hiromitsu Moriuchi [b], Yoshinori Okamoto [c], Shuhei Otsuki [c], Masashi Neo [c]

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ABSTRACT

Purpose: Causes of spontaneous osteonecrosis of the knee (SONK) have not been clearly elucidated. This study investigated the relationship between medial meniscal extrusion and SONK.
Methods: We reviewed 108 SONK knees and determined their Aglietti stage. Meniscal extrusion is defined when it extends beyond the medial margin of tibial plateau and osteophytes are excluded for determining the margin. Both absolute extrusion (AE) and relative percentage of extrusion (RPE) were measured, and meniscal tear patterns were evaluated in the early stages of SONK (I and II).
Results: All knees had meniscal extrusion. Stage I was detected in 39 knees; II, in 23; III, in 16; IV, in 18; and V, in 12. The mean AE and RPE were 4.2 mm and 42% in stage I, 5.0 mm and 52% in stage II, 6.8 mm and 71% in stage III, 7.0 mm and 69% in stage IV, and 7.8 mm and 80% in stage V, respectively. The knees in the early stages showed less AE and RPE than those in late stages IV ($p < 0.05$) and V ($p < 0.01$). Additionally, the level of AE ($\rho = 0.63$, $p < 0.0001$) and RPE ($\rho = 0.58$, $p < 0.0001$) correlated with the SONK stage. Of knees with early-stage SONK, 12 knees had no tear, 26 had horizontal tears, 1 had longitudinal tear, 6 had degenerative tears, 2 had radial tears, 1 had complex tear, and 14 had root tears. Neither AE nor RPE differed significantly among tear patterns.
Conclusions: Meniscal extrusion was recognized even in early stages, with a significant correlation between the SONK stage and extrusion. Although the most frequent tear pattern in early-stage SONK was horizontal tear, 12 knees had meniscal extrusion with no tears. Therefore, meniscal extrusion, which indicates meniscal dysfunction, may be a cause of SONK and be related with the developmental stage of SONK.

SPONTAN OSTEONEKROZ (SONK)

Tanı

- MR Görüntüleme
- Röntgen

MRI Findings in the Subchondral Bone Marrow: A Discussion of Conditions Including Transient Osteoporosis, Transient Bone Marrow Edema Syndrome, SONK, and Shifting Bone Marrow Edema of the Knee

Holly C. Gil, M.D.,[1] Scott M. Levine, M.D.,[1] and Adam C. Zoga, M.D.[2]

SPONTAN OSTEONEKROZ (SONK)

Evreleme

- Koshino Sınıflaması

Evre I: Yakınma + Radyolojik bulgu yok
Evre II: Yüklenme alanında skleroz ile çevrili düzleşme ve subkondral radyolusensi
Evre III: Subkondral kollaps
Evre IV: Osteoskleroz ve osteofitler ile dejeneratif bulgular

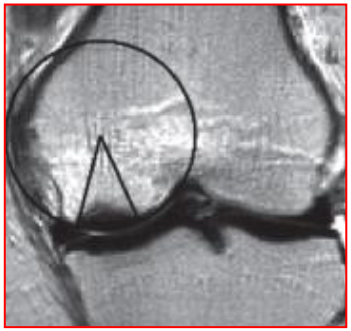
SPONTAN OSTEONEKROZ (SONK)

Tedavi

- Lezyon büyüklüğüne göre hareket edilmeli

Lezyon 3,5cm^2 den küçükse
LB/MFK oranı %20'den küçükse
Toplam lezyon açısı 150^0'den küçükse

« KONSERVATİF TEDAVİ »

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SPONTAN OSTEONEKROZ (SONK)

Konservatif Tedavi Yöntemleri

- Yüklenmenin azaltılması
- NSAİİ ve Analjezikler
- Bifosfonatlar : Osteoklastlara etki … kemik resorbsiyonunu engellemek … subkondral kollapsı engellemek
- Prostasiklin (İloprost):Vazodilatasyon etkisi ile terminal vasküler yatakta kanlanmayı arttırmak, kapiller geçirgenliği azaltmak, trombosit agregasyonunu azaltmak


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CrossMark

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SPONTAN OSTEONEKROZ (SONK)

Cerrahi Tedavi

- Lezyon büyüklüğü; %50'den fazla
  5 cm 'den büyükse
- 3-6 Aylık konservatif tedaviye yanıt vermeyen

Review Article

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SPONTAN OSTEONEKROZ (SONK)

Eklem Koruyucu Yöntemler

- Core Dekompresyon

Kemikiçi basıncı azaltıp kanlanmayı arttırmak amaç

Erken Evre için ağrıyı azaltmaya ve iyileşmeye yardımcı

- Core Dekompresyon + İyileşmeyi arttırıcı uyg

(Kalsiyum fosfat , Kİ aspiratı vb)

Review Article

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Forst J, Forst R, Heller KD, et al. Spontaneous osteonecrosis of the femoral condyle: causal treatment by early core decompression. Arch Orthop Trauma Surg1998;117:18-22.

SPONTAN OSTEONEKROZ (SONK)

Eklem Koruyucu Yöntemler

- Osteokondral Greftleme

Subkondral kollapsı olan olgularda

Tanaka Y, Mima H, Yonetani Y, et al. Histological evaluation of spontaneous osteonecrosis of the medial femoral condyle and short-term clinical results of osteochondral autografting: a case series. Knee 2009;16:130-5.

Duany NG, Zywiel MG, McGrath MS, et al. Joint-preserving surgical treatment of spontaneous osteonecrosis of the knee. Arch Orthop Trauma Surg 2010;130:11-6.

SPONTAN OSTEONEKROZ (SONK)

Eklem Koruyucu Yöntemler

- Yüksek Tibial Osteotomi

Genç, aktivite düzeyi yüksek olgularda

Saito T, Kumagai K, Akamatsu Y, et al. Five- to ten-year outcome following medial opening-wedge high tibial osteotomy with rigid plate fixation in combination with an artificial bone substitute. Bone Joint J 2014;96-B:339-44.

SPONTAN OSTEONEKROZ (SONK)

Artroplasti

- Unikondiler Artroplasti

Tek kompartmanın tutulduğu ve ileri evre olgularda

52 Olgu 11 yıllık Takip Revizyon %7,7

Heyse TJ, Khefacha A, Fuchs-Winkelmann S, et al. UKA after spontaneous osteonecrosis of the knee: a retrospective analysis. Arch Orthop Trauma Surg 2011;131:613-7.

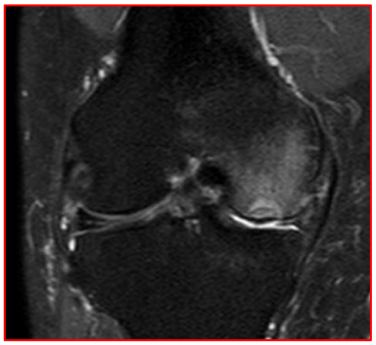
SPONTAN OSTEONEKROZ (SONK)

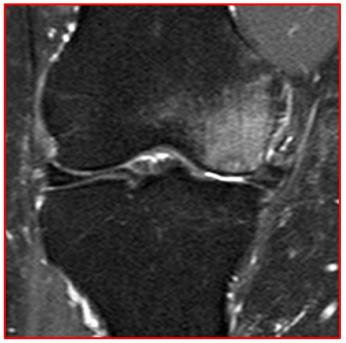
Artroplasti

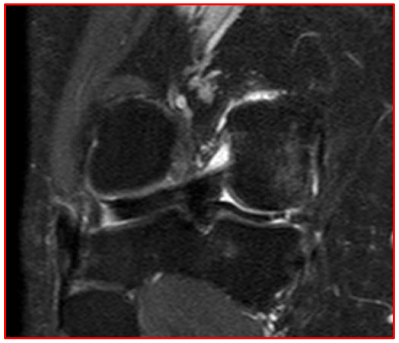
- Total Artroplasti

Birden fazla kompartmanın tutulduğu ve ileri evre olgularda

57 y Erkek
3 yıldır ağrı
BMİ: 35







SEKONDER OSTEONEKROZ

Klinik

- 45 yaş altı, erkeklerde daha sık
- Bilateral tutulum
- Multifokal
- Diğer eklem tutulumu
- Daha yavaş başlayan ağrı

SEKONDER OSTEONEKROZ

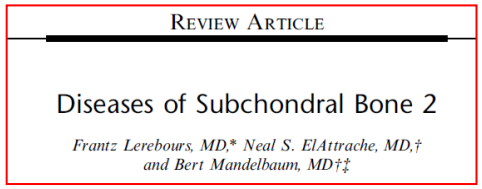
Etyopatogenez

- Kortikosteroid kullanımı ve Alkolizm

Kemik iliğindeki yağ hücrelerinde genişleme … kemikiçi basınç artışı ve ödem … iskemi

- Diğer risk faktörleri; Vazo-oklüziv durumlar

Orak Hüc Anemi, Gaucher hst, Lösemi, Myeloproliferatif hst, Vurgun


REVIEW ARTICLE

Diseases of Subchondral Bone 2

Frantz Lerebours, MD, Neal S. ElAttrache, MD,† and Bert Mandelbaum, MD†‡*


Review Article

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Osteonecrosis of the knee: review

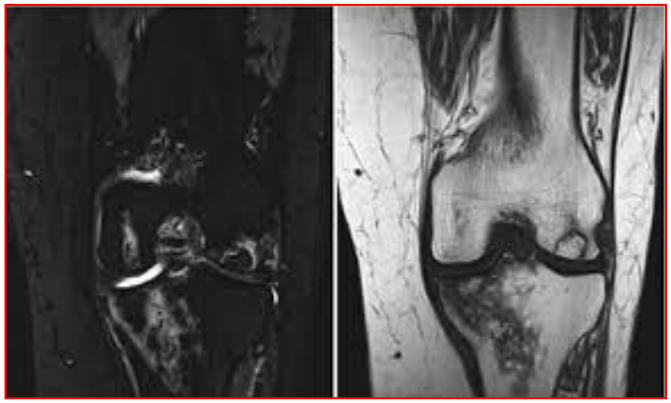
Ammar R. Karim[1], Jeffrey J. Cherian[2], Julio J. Jauregui[2], Todd Pierce[2], Michael A. Mont[2]

[1]Rowan University, School of Osteopathic Medicine, Stratford, NJ, USA; [2]Rubin Institute for Advanced Orthopedics, Center for Joint Preservation and Reconstruction, Sinai Hospital of Baltimore, Baltimore, MD, USA

SEKONDER OSTEONEKROZ

Tanı

- MR Görüntüleme



SEKONDER OSTEONEKROZ

Evreleme

- Mod Ficat-Arlet

Evre I: Normal eklem aralığı
Evre II: Normal EA + hafif skleroz
Evre III: Subkondral kollaps, kresent bulgusu, hafif daralma
Evre IV: Kondilde çökme, dejeneratif bulgular, belirgin daralma

SEKONDER OSTEONEKROZ

Konservatif Tedavi

- Sadece asemptomatik hastalar için geçerli

Mont (2000) Semptomatik olgularda başarı %19
8 yıllık takipte %70 olgu artroplastiye ihtiyaç

Mont MA, Baumgarten KM, Rifai A, et al. Atraumatic osteonecrosis of the knee. J Bone Joint Surg Am 2000;82:1279-90.

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SEKONDER OSTEONEKROZ

Konservatif Tedavi

- Yükten kurtarma
- NSAİİ ve ağrı kesiciler
- Bifosfonatlar ve Prostasiklin

Stage I-II de ağrı ve fonksiyonel iyileşme sağlayabilir.

Jäger M, Tillmann FP, Thornhill TS, et al. Rationale for prostaglandin I2 in bone marrow oedema--from theory to application. Arthritis Res Ther 2008;10:R120.

SEKONDER OSTEONEKROZ

Eklem Koruyucu Girişimler

- Kollaps öncesi evrelerde uygulanabilir

  Core dekompresyon
  Kemik İmpaksiyon Greftleme
  Osteokondral Allogreft

SEKONDER OSTEONEKROZ

Artroplasti

- Evre III-IV için en uygun tedavi Total Diz Protezi

Mont MA, Rifai A, Baumgarten KM, et al. Total knee arthroplasty for osteonecrosis. J Bone Joint Surg Am 2002;84-A:599-603.

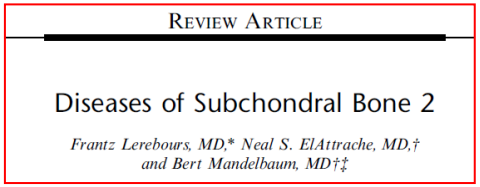
30 olgu
9 yıllık takip
%97 sağkalım

POSTARTROSKOPİK ON

Klinik

- Nadir görülen ON şeklidir. %4
- %82 MFK de

Artroskopik Menisektomi
Kondroplasti
Laser/RF kullanımı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POSTARTROSKOPİK ON

Klinik

- Semptomlar ort 6-8 hafta sonra başlar
- 40'lı yaşlarda daha sık
- Ani başlayan ağrı
- İşlem yapılan kompartmanda


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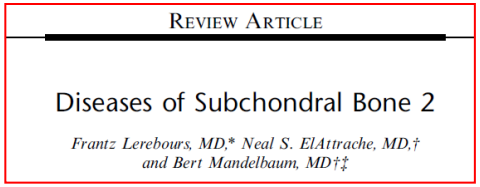
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POSTARTROSKOPİK ON

Etyopatogenez

- Menisektomi sonrası değişen biyomekaniğin yolaçtığı kontakt basınç artışı … yetmezlik kırığı … intraossöz sinovyal sıvı girişi …ON
- Termal enerjinin tetiklediği inflamatuar süreç … kemik ödemi … ON


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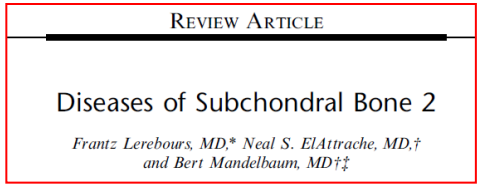
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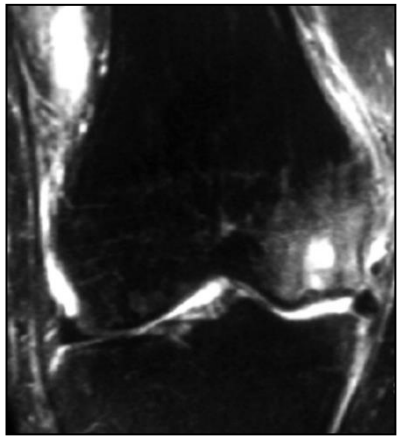
POSTARTROSKOPİK ON

Tanı

- MR görüntülerinde artroskopi öncesi olmayan kemik ödeminin görülmesi ya da genişlemesi
- Osteonekroz gelişimi ile tipik MR ve Röntgen görüntüleri





POSTARTROSKOPİK ON

Konservatif Tedavi

- Yükten kurtarma
- NSAİİ ve ağrı kesiciler
- Bifosfonatlar ve Prostasiklin

POSTARTROSKOPİK ON

Eklem Koruyucu Girişimler

- Core Dekompresyon
- Osteokondral Greftleme
- Yüksek Tibial Osteotomi

POSTARTROSKOPİK ON

Artroplasti

- Unikondiler Artroplasti
- Total Diz Protezi

İLGİNİZE TEŞEKKÜR EDERİM