Ventriküler Non-compaction

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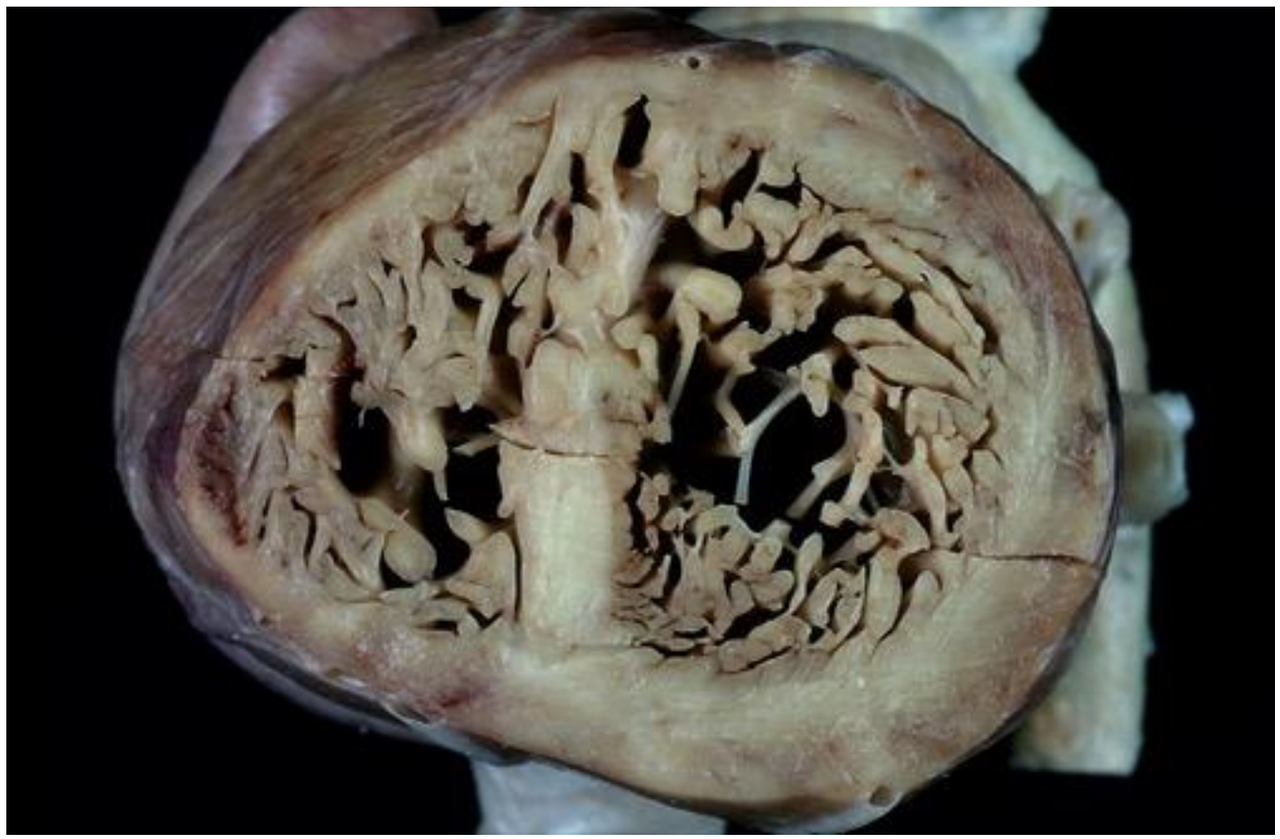
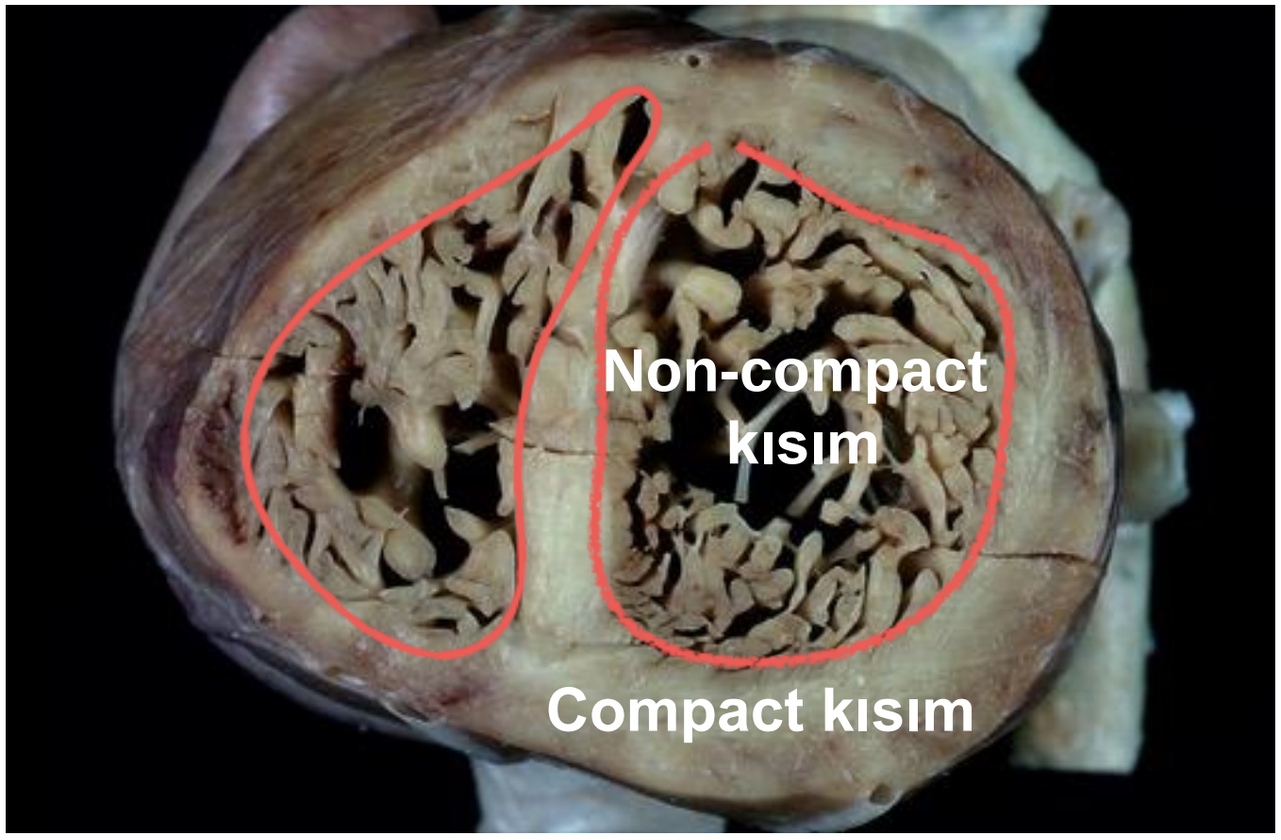
Tanım

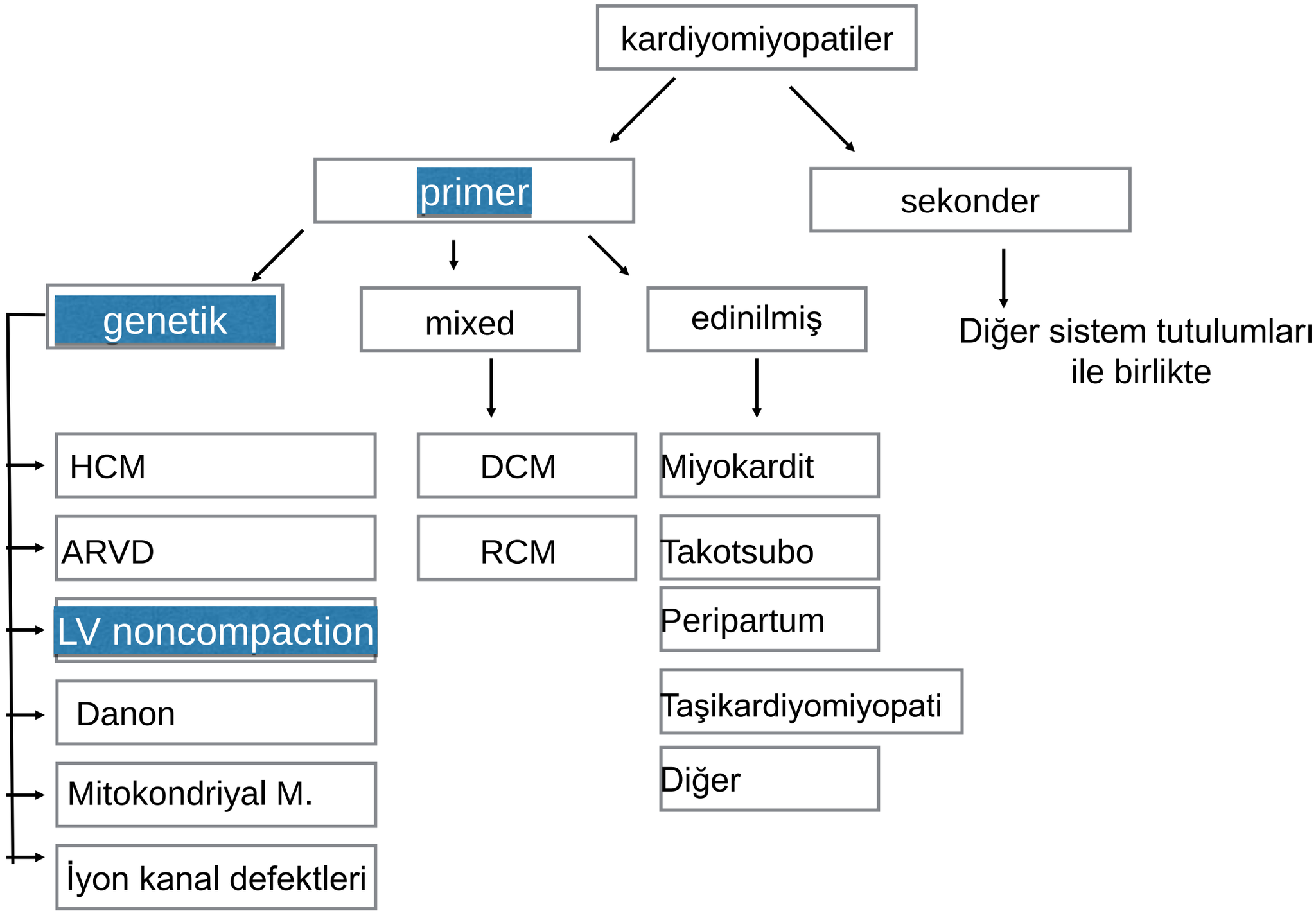
- Hipertrabekülasyon ve derin intertrabeküler resesuslar nedeniyle iki katmanlı bir görünüme sahip bir kardiyomiyopati

- Resesuslara renkli doppler ile kan girişi gösterilebilir ancak epicardial koroner sistemle bir fistülizasyon olmamalı!




Non-compact
kısım
Compact kısım

2006 AHA kardiyomiyopati sınıflaması



2008 ESC sınıflaması

- Dilate kardiyomiyopati (DCM)
- Hipertrofik kardiyomiyopati (HCM)
- Restriktif kardiyomiyopati (RCM)
- Aritmojenik Sağ Ventrikül Kardiyomiyopatisi (ARVC)
- Sınıflandırılamayan kardiyomiyopatiler (Noncompaction, sirotik kardiyomiyopati, stres-induced kardiyomiyopati)

Echocardiographic criteria

Chin *et al.*[14]	Jenni *et al.*[7]
• LVNC is defined by a ratio of X/Y $\leq$ 0.5	• Bilayered myocardium consisting of a thin C layer and a much thicker NC layer with deep endomyocardial recesses: NC/C > 2
• These criteria evaluate trabeculae at the LV apex using the parasternal short-axis and apical views and on the LV free wall thickness at end-diastole	• Predominant location of the pathology is midlateral, midinferior, and apex
	• Evidence of intertrabecular recesses filled with blood from the LV cavity
	• Acquisition of images views: short-axis with measurement of NC/C ratio performed at end-systole
Stöllberger and Finsterer[19]	Authors' proposal (criteria not validated)
• Four or more trabeculations protruding from the LV wall, located apically to the papillary muscles and visible in one imaging plane	• An evaluation of the trabeculations' sizes (NC myocardium) in relation to C wall thicknesses in multiple imaging windows and at different ventricular levels throughout the cardiac cycle
• Trabeculations with the same echogenicity as the myocardium and synchronous movement with ventricular contractions	• Identification of the bilayered myocardium (C and NC) in the short-axis views at the mid and apical levels and in the apical two- and four-chamber and apical long-axis views
• Perfusion of the intertrabecular recesses from the LV cavity	• Thicknesses of the C and NC sections of the myocardium are best measured in the short-axis views at end-diastole, with an NC/C ratio > 2 being diagnostic of LVNC
• Acquisition of the images in the apical four-chamber view, atypical views to obtain the best quality image to differentiate between false chords, aberrant bands and trabeculations	

MRI criteria

Petersen *et al.*[23]	Jacquier *et al.*[22]
• Ratio between NC and C layers > 2.3 at end-diastole	• Trabeculated LV mass > 20% of global LV mass (measurements made at end-diastole)

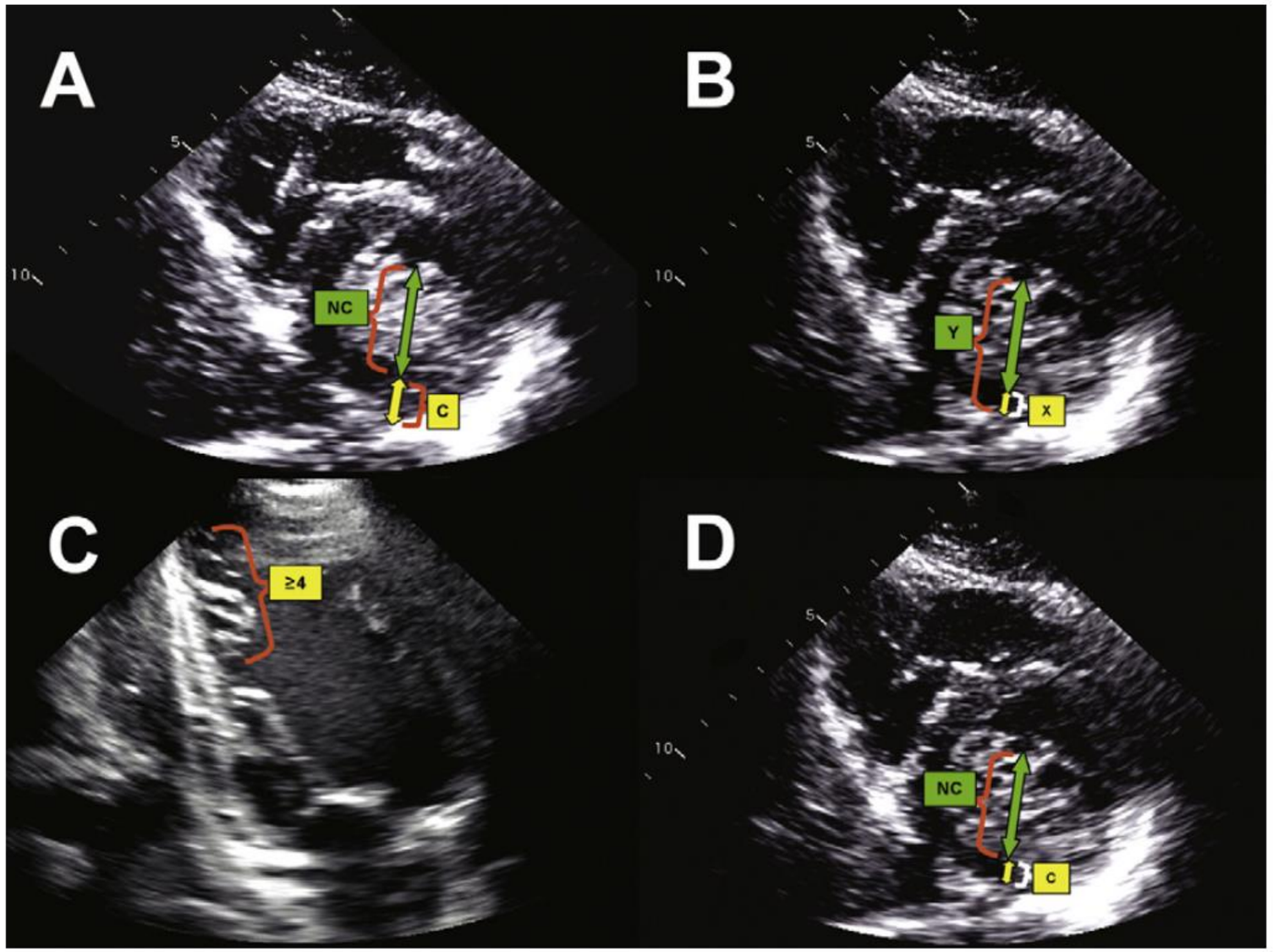
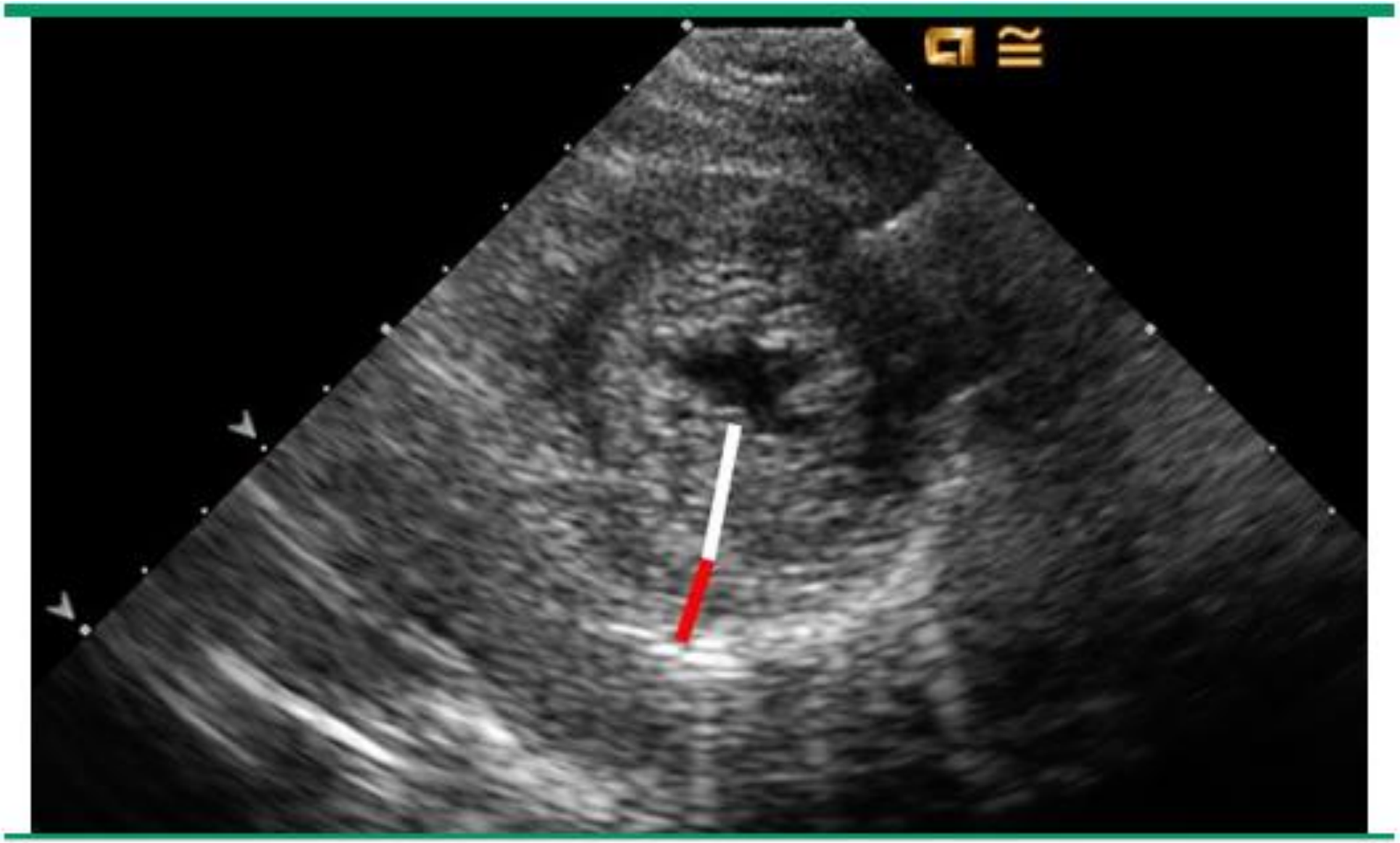
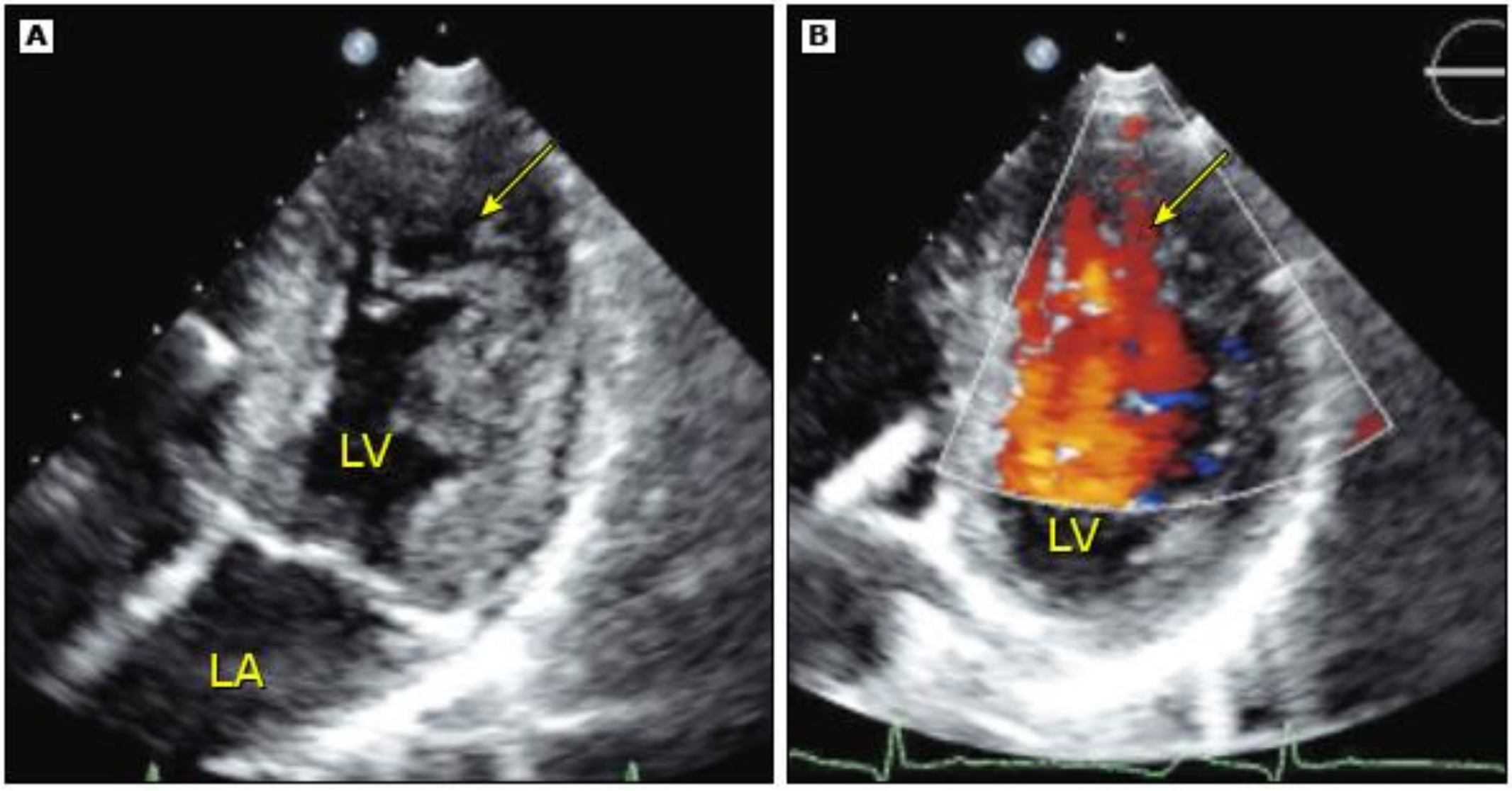


Figure 10 Diagnostic criteria for LVNC. **(A)** Jenni (Zurich) criteria: LVNC is defined by a ratio of noncompacted (NC) to compacted (C) myocardium > 2, measured at end-systole. **(B)** Chin (California) criteria: LVNC is defined by a ratio of the distance from the epicardial surface to the trough of the trabecular recesses (X) to the distance from the epicardial surface to the peak of the trabeculations (Y) ≤ 0.5, measured at end-diastole. **(C)** Stöllberger (Vienna) criteria: LVNC is defined by trabeculations (four or more) protruding from the LV wall, located apically to the papillary muscles and visible in one imaging plane. **(D)** Our (Wisconsin) criteria (not validated): LVNC is defined by an NC/C ratio > 2, measured at end-diastole.



Short-axis view of a two-dimensional echocardiogram at endsystole in a patient with isolated left ventricular noncompaction. The ratio of noncompacted myocardium (white line) to compacted myocardium (red line) is 2.2:1. A ratio ≥2:1 at end-systole with thickening of the myocardial wall is considered to be diagnostic of left ventricular noncompaction. A ratio ≥2:1 is occasionally seen in patients with dilated cardiomyopathy, but there is no thickening of the myocardial wall.


A
LV
LA
B
LV

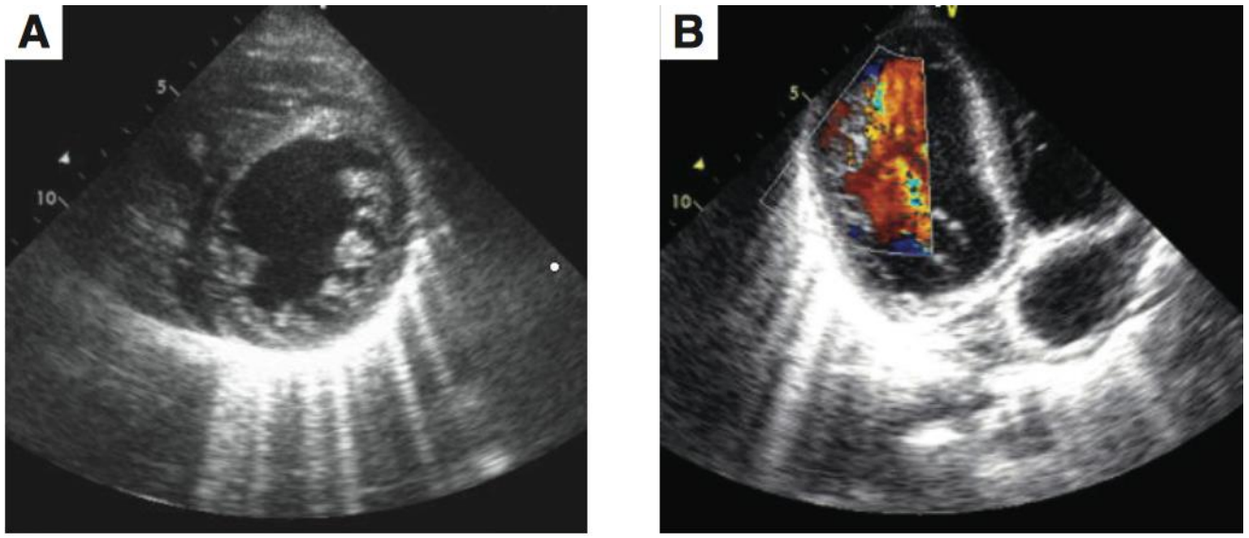
Hipotezler

- Fetal miyokardın gelişimi esnasında meydana gelen intrauterin bir duraklama

- Miyokardın noncompact olarak kalması değil, bir katman olarak trabeküler yapının anormal olarak prolifere olması

Ayırıcı tanı

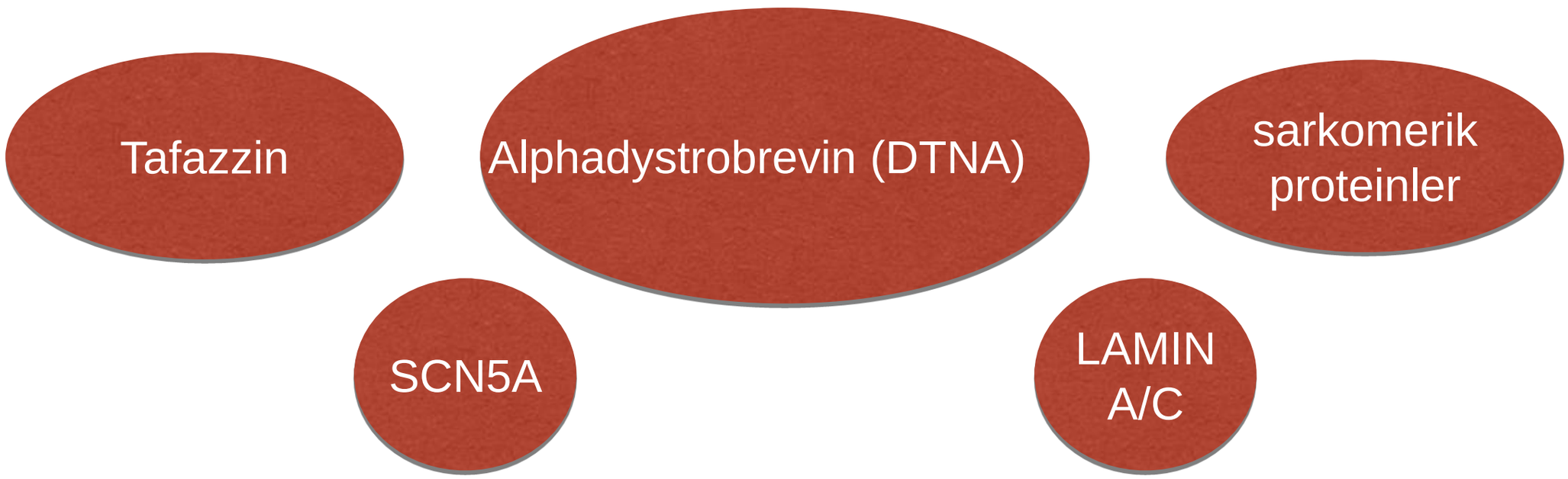
- Gebelikte hipertrabekülasyon
- Atletlerde hipertrabekülasyon
- Hematolojik patolojilere bağlı hipertrabekülasyon



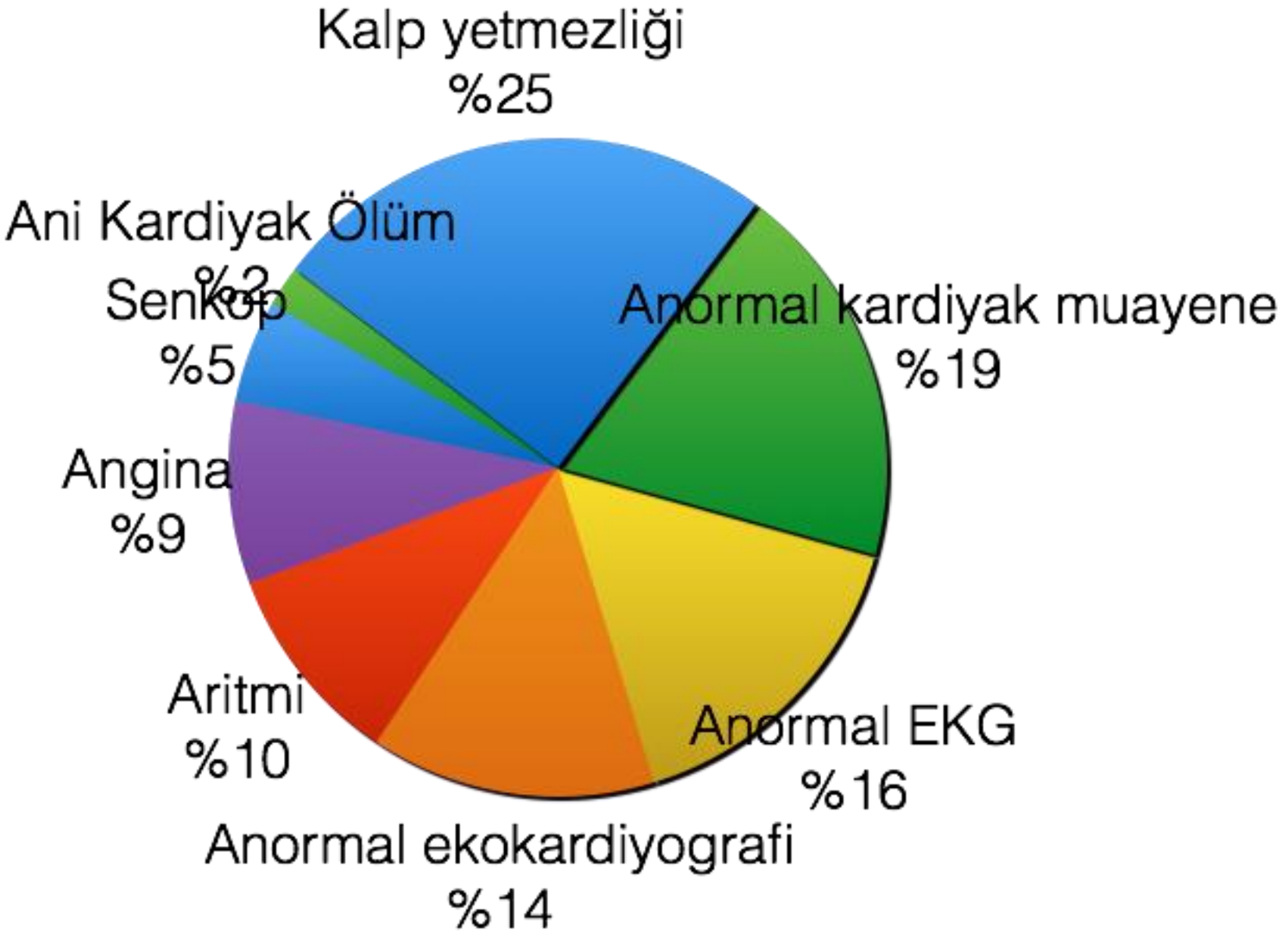
* Kilic ID, Cardiovasc J Afr. 2013 ;24(3):e1-2

Genetik

- Sporadik yada familyal(%12-50) olabilir
- OD kalıtım, OR ve X'e bağlı kalıtılan formlardan daha sık
- HCM, DCM ve RCM ile birliktelik olabilir



Klinik manifestasyon



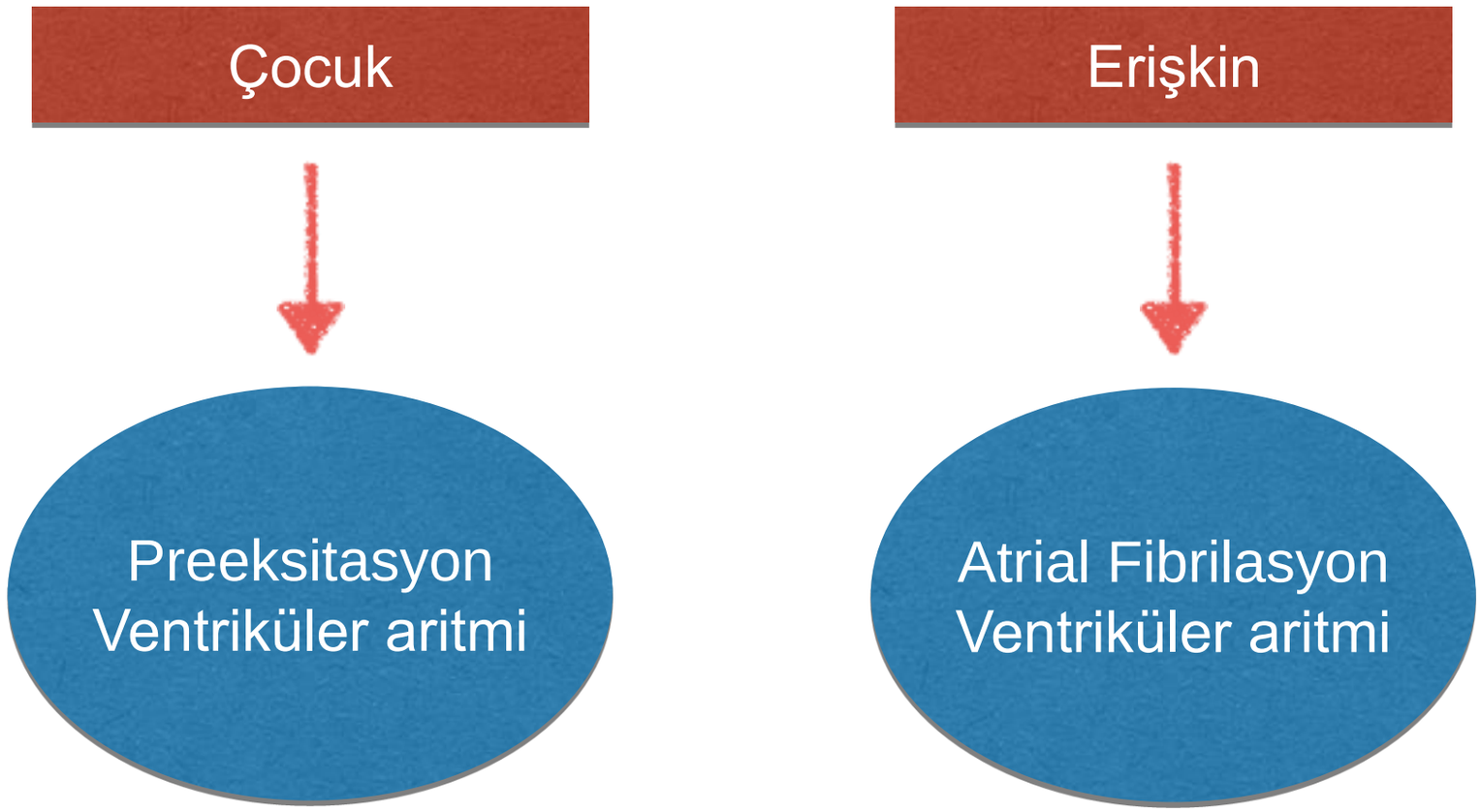
Aritmiler

- Hem ventriküler hem atriyal aritmiler görülebilir
- NSVT oldukça sık(%35), sustained VT %5 sıklıkta*
- Atrial fibrilasyon sıklığı %10
- Dal blokları ve AV blok da görülebilir

Bhatia NL et al. J Card Fail. 2011 Sep;17(9):771-8

Aritmiler

- Aritmi sıklığı ve tipi ventrikül fonksiyonları ve yaşla ilişkili olabilir



A novel lamin A/C gene missense mutation (445 V > E) in immunoglobulin-like fold associated with left ventricular non-compaction

Zhouying Liu , Hong Shan , Jian Huang , Ning Li , Cuihong Hou , Jielin Pu

Abstract

Aims Two *LMNA* mutations (R644C and R190W) have been associated with familial and sporadic left ventricular non-compaction (LVNC). However, the mechanisms underlying these associations have not been elucidated.

Methods and results Genomic DNA was isolated from peripheral blood leucocytes and analysed by direct sequencing. Human embryonic kidney 293 cells were transfected with either wild type or mutant LMNA and SCN5A for whole-cell patch-clamp experiment and fluorescence microscopy. Point mutation modeling for mutant LMNA was also performed. One novel LVNC-associated mutation (V445E) in β2 sheet of immunoglobulin (Ig)-like fold was found in the proband and his father. We also found that the peak current of sodium channel was markedly reduced in mutant LMNA compared with WT while the activation, inactivation, and recovery curves were not significantly altered. The mutant lamin A/C were aggregated into multiple highlighted particles. Three β [illegible] side chains in Ig-like fold were altered due to the replacement of a valine by glutam[illegible]

Conclusion Our data associated a novel [illegible] (V445E) with a sudden death form of familial LVNC. The reduced sodium current in mutant LMNA may account for the advent of malignant ventricular arrhythmias. The altered structures of three β sheets and side chains may partially explain the aggregation of lamin A/C protein subjacent to the nuclear envelope.

Lamin A/C

Ailesel formunda ani ölüm ve malign ventriküler aritmi birlikteliği

Mol Genet Metab. 2011 Feb;102(2):200-6. doi: 10.1016/j.ymgme.2010.09.009. Epub 2010 Sep 29.

Identification of a novel TPM1 mutation in a family with left ventricular noncompaction and sudden death.

Chang B[1], Nishizawa T, Furutani M, Fujiki A, Tani M, Kawaguchi M, Ibuki K, Hirono K, Taneichi H, Uese K, Onuma Y, Bowles NE, Ichida F, Inoue H, Matsuoka R, Miyawaki T; Noncompaction study collaborators.

Collaborators (43)

Author information

Abstract

Left ventricular noncompaction (LVNC) is a cardiomyopathy morphologically characterized by 2-layered myocardium, numerous prominent trabeculations, and deep intertrabecular recesses communicating with the left ventricular cavity. The purpose of this study was to investigate patients with LVNC for p with LVNC for mutations by polymerase cha Lys37Glu) was identified in three affected members of a family with isolated LVNC. The substitution brings about a change in amino acid charge at a highly conserved residue and could result in aberrant mRNA splicing. This variant was not identified in 200 normal control samples. Pathologic analysis of a right ventricular myocardial specimen from the proband's maternal aunt revealed endocardial and subendocardial fibrosis with prominent elastin deposition, as well as the presence of adipose tissue between muscle layers, pathologic changes that are distinct from those seen in patients with HCM or DCM. Screening of the proband and her mother for variants in other sarcomeric protein-encoding candidate genes, MYH7, MYBPC3, TNNT2, TNNI3, ACTC, MYL2, and MYL3, did not identify any other non-synonymous variants or variants in splice donor-acceptor sequences that were potentially disease causing. We conclude TPM1 is a potential candidate disease-causing gene for isolated LVNC, especially in patients experiencing sudden death.

LVNC li 51 hastada 4 gen taranmış

Bazı mutasyonlar da daha kötü seyir

TMP1

J Am Coll Cardiol. 2014 Aug 26;64(8):745-56. doi: 10.1016/j.jacc.2014.05.045.

HCN4 mutations in multiple families with bradycardia and left ventricular noncompaction cardiomyopathy.

Milano A[1], Vermeer AM[2], Lodder EM[1], Barc J[3], Verkerk AO[4], Postma AV[4], van der Bilt IA[1], Baars MJ[2], van Haelst PL[5], Caliskan K[6], Hoedemaekers YM[7], Le Scouarnec S[8], Redon R[9], Pinto YM[1], Christiaans I[2], Wilde AA[1], Bezzina CR[10].

Author information

Abstract

BACKGROUND: Familial forms of primary sinus bradycardia have sometimes been attributed to mutations in HCN4, SCN5A, and ANK2. In these studies, no structural cardiac alterations were reported in mutation carriers. However, a cluster of reports in the literature describe patients presenting with sinus bradycardia in association with left ventricular noncompaction cardiomyopathy (LVNC), pointing to a shared genetic cause.

OBJECTIVES: This study sought to identify the genetic defect underlying the combined clinical presentation of bradycardia and LVNC, hypothesizing that these 2 clinical abnormalities have a common genetic cause.

METHODS: Exome sequencing was carried out in 2 cousins from the index family that were affected by the combined bradycardia-LVNC phenotype; shared variants thus identified were subsequently overlaid with the chromosomal regions shared among 5 affected family members that were identified using single nucleotide polymorphism array analysis.

RESULTS: The combined linkage analysis and exome sequencing in the index family identified 11 novel variants shared among the 2 affected cousins. One of these, p.Gly482Arg in HCN4, segregated with the combined bradycardia and LVNC phenotype in the entire family. Subsequent screening of HCN4 in 3 additional families with the same clinical combination of bradycardia and LVNC identified HCN4 mutations in each. In electrophysiological studies, all found HCN4 mutations showed a more negative voltage dependence of activation, consistent with the observed bradycardia.

CONCLUSIONS: Although mutations in HCN4 have been previously linked to bradycardia, our study provides the first evidence to our knowledge that mutations in this ion channel gene also may be associated with structural abnormalities of the myocardium.

Sinusal Bradikardi ve LV noncompaction birlikteliği !

HCN4 gen mutasyonu

Outcomes, Arrhythmic Burden and Ambulatory Monitoring of Pediatric Patients With Left Ventricular Non-Compaction and Preserved Left Ventricular Function

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Pediatric patients with left ventricular noncompaction (LVNC) and severe ventricular dysfunction are at risk for sudden death. The aims of this study were to (1) evaluate outcomes, (2) describe arrhythmic burden on Holter monitoring, and (3) analyze the utility of Holter monitoring and its impact on care in pediatric patients with LVNC and preserved or mild ventricular dysfunction. This was a retrospective study including patients <21 years of age with LVNC and ejection fractions ≥45%. Demographic and outcome data were analyzed. Individual and cumulative Holter data were evaluated for all patients. Arrhythmias, conduction system disease, and symptoms were analyzed for each Holter recording. The incidence of significant findings and the impact on care were determined for each study. Outcome and Holter data were compared between patients on the basis of the ejection fraction (≥55% [normal] or ≥45% to <55% [mild]). This study included 72 patients, 65 with normal function and 7 with mild dysfunction (mean age 13 years). There was a single death in the cohort, which was sudden in nature. Simple ventricular ectopy was common on Holter monitoring and more common in patients with mild dysfunction (86% vs 27%, p = 0.005). Significant Holter findings (4% vs 6%) and changes to patient care (2% vs 4%) improved with cumulative Holter monitoring. In conclusion, in contrast to patients with severe dysfunction, pediatric patients with LVNC and normal or mild dysfunction have significantly better outcomes. However, worsening LV systolic function was correlated with increasing ventricular ectopy. The role of Holter monitoring is unknown, but it may have utility in patient care if used as part of ongoing screening.

Daha kötü LV fonksiyonu , daha sık ventriküler ektopi

Pacing Clin Electrophysiol. 2008 Apr;31(4):461-7. doi: 10.1111/j.1540-8159.2008.01015.x.

Implantable cardioverter-defibrillators in patients with left ventricular noncompaction.

Kobza R[1], Jenni R, Erne P, Oechslin E, Duru F.

Author information

Abstract

BACKGROUND: Left ventricular noncompaction (LVNC) is a rare, congenital cardiomyopathy and can be associated with heart failure, embolic events, arrhythmias, and sudden cardiac death. Implantation of implantable cardioverter-defibrillators in these patients is a treatment option, but data on long-term follow-up are limited. The aim of the study was to analyze the clinical outcome of patients with LVNC who were treated with an implantable cardioverter-defibrillator (ICD).

METHODS: We conducted a retrospective study on 12 patients (mean age: 45 +/- 13 years, range 20-60) with LVNC, who underwent ICD implantation for secondary (n = 8) and primary (n = 4) prevention.

RESULTS: During a median follow-up of 36 months, five patients (42%) presented with appropriate ICD therapy: in four of the eight patients (50%) in whom the ICD was implanted as a secondary prevention and in one of the four patients (25%) for whom the ICD was implanted for primary prevention. In eight patients (66%) supraventricular tachyarrhythmias were documented. Improvement of left ventricular function could be observed in one of two patients with a biventricular ICD.

CONCLUSIONS: Potentially life-threatening ventricular tachyarrhythmias may occur in patients with LVNC. ICD therapy may be effective for primary

8’i sekonder 4’ü primer koruma Icd li 12 hasta 36 ay boyunca retrospektif olarak incelenmiş
5 hasta uygun ICD terapisi almış bunların 4’ü sekonder koruma amaçlı olan hastalar
8 hastada SVT dökümente edilmiş

Bu hastalarda ICD tedavisi primer ve sekonder korumada etkili olabilir. Supraventriküler taşikardiler de sık olduğu için Uygunsuz Şoklama da fazla. Cihaz ayarlamalarına dikkat edilmelidir.

Mortality and Sudden Death in Pediatric Left Ventricular Noncompaction in a Tertiary Referral Center

Samuel T. Brescia, MD; Joseph W. Rossano, MD; Ricardo Pignatelli, MD; John L. Jefferies, MD; Jack F. Price, MD; Jamie A. Decker, MD; Susan W. Denfield, MD; W. Jeffrey Dreyer, MD; O'Brian Smith, PhD; Jeffrey A. Towbin, MD; Jeffrey J. Kim, MD

Background—Left ventricular noncompaction is a cardiomyopathy characterized by excessive trabeculation of the left ventricle, progressive myocardial dysfunction, and early mortality. Left ventricular noncompaction has a heterogeneous clinical presentation that includes arrhythmia and sudden cardiac death.

Methods and Results—We retrospectively reviewed all children diagnosed with left ventricular noncompaction at Texas Children's Hospital from January 1990 to January 2009. Patients with congenital cardiac lesions were excluded. Two

Tek merkezli bir çalışmada eko ile tanı konan 242 çocuğun 19 yıllık takipte klinik presentasyonuna bakıldığında;

- Kalp yetersizliği 150 hasta (% 62)
- Aritmi 81 (%33), 42 %17 VT, 14 (%6) atriyal taşikardi, 19 (%8) SVT
- Senkop %5
- Ani kardiyak ölüm %6

Hastaların 31'i (%12,8) öldü, 13 hasta (%5,4) ü kalp nakli oldu

Conclusions—Left ventricular noncompaction has a high mortality rate and is strongly associated with arrhythmias in children. Preceding cardiac dysfunction or ventricular arrhythmias are associated with increased mortality. Children with normal cardiac dimensions and normal function are at low risk for sudden death. (*Circulation*. 2013;127:2202-2208.)

Key Words: arrhythmias, cardiac ■ cardiomyopathies ■ death, sudden ■ heart failure

Önceki kardiyak disfonksiyon veya ventriküler aritmi artmış mortaliteyle ilişkili

J Card Fail. 2011 Sep;17(9):771-8. doi: 10.1016/j.cardfail.2011.05.002.

Isolated noncompaction of the left ventricular myocardium in adults: a systematic overview.

Bhatia NL[1], Tajik AJ, Wilansky S, Steidley DE, Mookadam F.

Author information

Abstract

BACKGROUND: Owing to inconsistent diagnostic criteria and small heterogeneous cohorts, little is known about the long-term outcomes of adult left ventricular noncompaction (LVNC), a rare cardiomyopathy with potentially serious outcomes. This systematic overview aimed to better delineate the natural history of adult LVNC.

METHOD AND RESULTS: A comprehensive computerized search using "noncompaction" and its synonyms initially identified 206 articles, with reference lists subsequently hand scanned. These searches yielded 5 studies that were eligible for this systematic overview, identifying adult cohorts with isolated LVNC diagnosed by similar echocardiographic criteria. This combined cohort (n = 241) was followed for a mean duration of 39 months. The annualized event rate was 4% for cardiovascular deaths, 6.2% for cardiovascular death and its surrogates (heart transplantation and appropriate implantable cardioverter-defibrillator

241 erişkin hastalı 5 çalışmanın incelendiği sistematik incelemede;
Hastalar ortalama 39 ay takip edilmiş
Hastaların %56 sı kalp yetersizliği, %27 si ön değerlendirmede LVNC şüphesiyle, %11 ide tarama esnasında tespit edilmiş
Yıllık kardiyovasküler mortalite %4
1. Derece akrabalarında LVNC varlığı eko ile %30 oranında saptanmıştır

Özet ve öneriler

- LVNC Hipertrabekülasyon ve derin intertrabeküler resesuslar ile karakterize sporadik veya ailesel kardiyomyopatidir

- LVNC tanısı zor bir klinik durumdur (tanıya kadar gecen ortalama zaman 3.4 yıl)

- Klinik manifestasyon olarak kalp yetersizliği, göğüs ağrısı, tromboembolik olay, atrial ve ventriküler aritmi ve ani ölüm görülebilir

- EF<%40 veya AF li hastalarda antikoagülasyon önerilmektedir

Özet ve öneriler

- Ventriküler ve supraventriküler aritmiler sıklıkla izlenmektedir
- ICD takılacak hastanın belirlenmesinde henüz net öneriler bulunmamaktadır
- Uygunsuz şok sık karşılaşılmaktadır bu nedenle bunu azaltıcı önlemler alınmalıdır
- VT fırtınalarını azaltmak amacıyla VT ablasyonu planlanmalıdır.
- End-stage kalp yetersizlikli hastalar kardiyak transplantasyon açısından değerlendirilmelidir.

Sabrınız için teşekkürler..