Kan Basıncında Yeni Kavramlar

Eskimeyen Yeniler:
Nabız Hızı ve Nabız Basıncı

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Kardiyoloji Anabilim Dalı

Nabız Basıncı

- **Nabız Basıncı:** **Sistolik KB– Diyastolik KB**

- **İleri yaşlarda; Aorta ve büyük arterlerin sertliği ↑**
- **Daha gençlerde; stroke volume artışı**

- **Yaş ↑ (> 55-60 yaş) → SKB ↑**
- **Kısa Boy, Cinsiyet, Kalp hızı ↓**
- **Metabolik Sendrom - Diyabet**

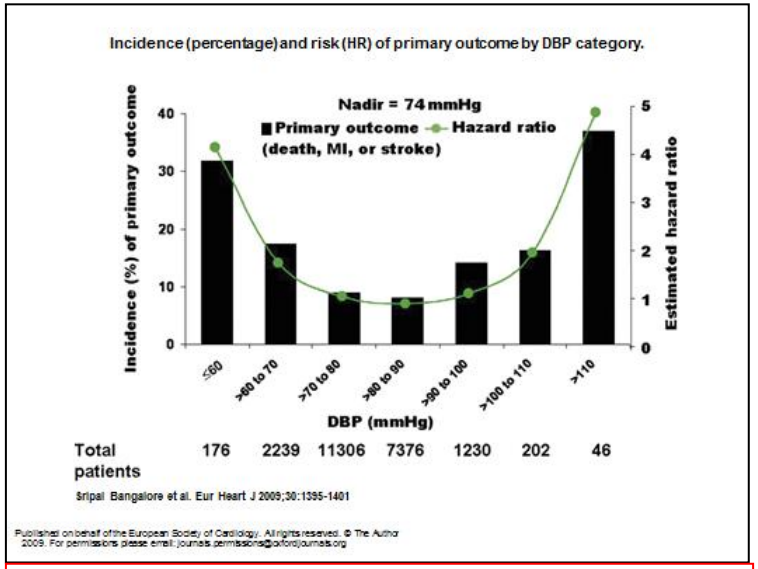
Artmış Nabız Basıncı

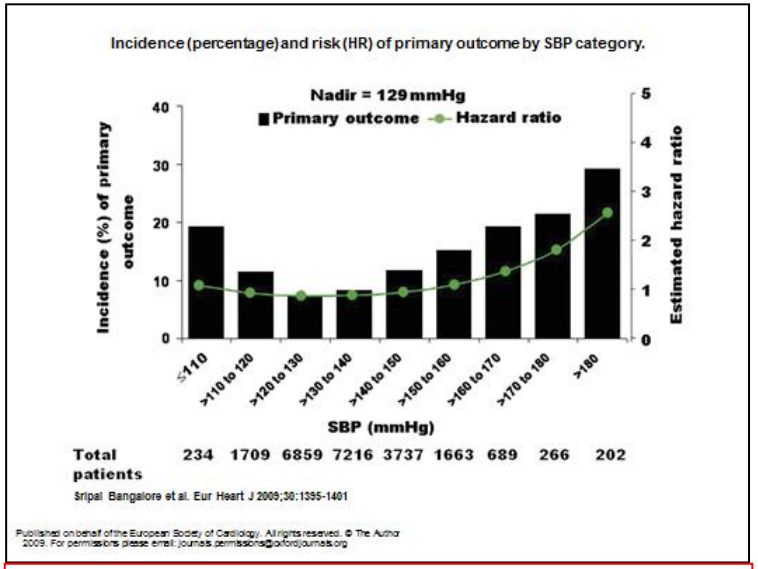
Artmış Nabız Basıncı ile KVS Olay İlişkisi

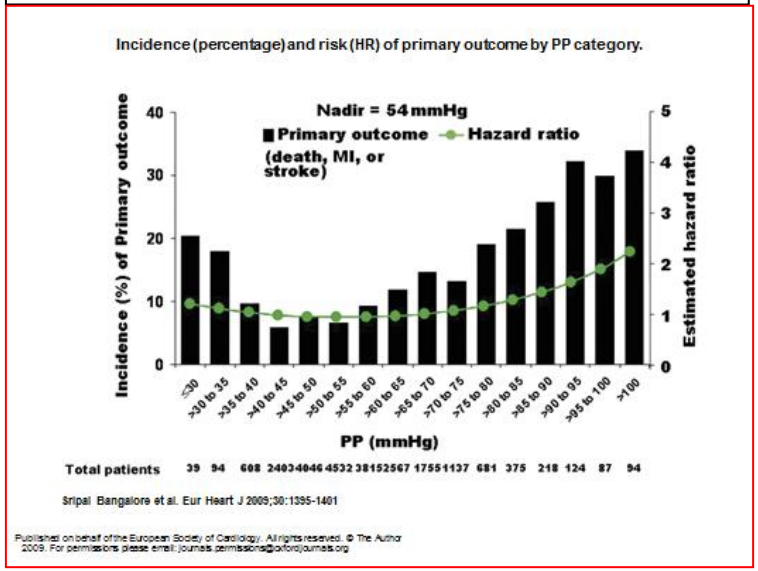
- **Çelişkili Sonuçlar: Risk değil, risk↑ (hafif-orta-yüksek),**
- **Framingham Kalp Çalışması: Normo ve HT hastalarda >60 yaş KKH ile ilişkili**
- **SHEP Çalışması: İlaç alan grupta, her 10 mmHg PP artışı, inme KKY ile ilişkili (PLASEBO grubunda anlamlı değil)**
- **Syst-Euro Çalışması: Her 10 mmHg PP artışında, KVS sonlanım ↑ (İLAÇ grubunda ANLAMLI değil)**

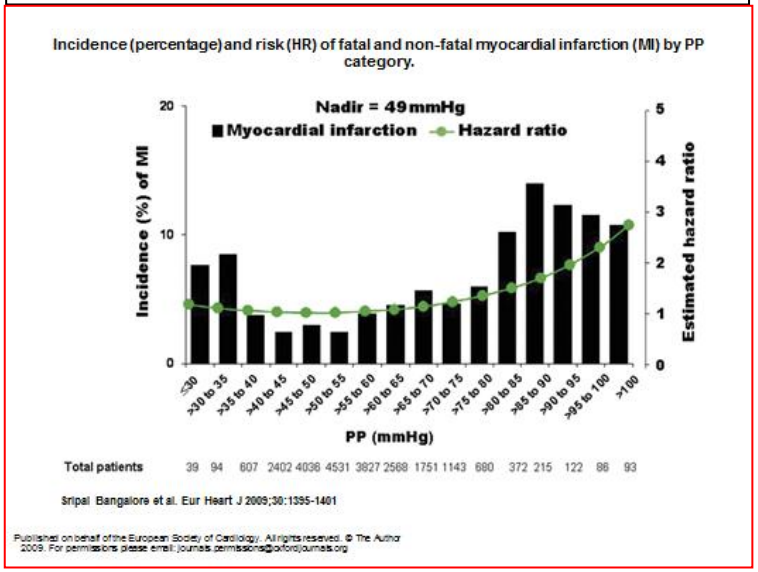
➔ **Artmış PP (>60 mmHg): ileri yaşlarda (>55-60y), atheroskleroz ve koroner olay (AMI) riski ↑**

İNVEST Çalışması









Nabız Basıncı; primer sonlanım noktası için; SKB, DKB, MAP'den daha ZAYIF bir öngörüdürücü

Amlodipine+Benazepril is Superior to Hydrochlorothiazide+Benazepril Irrespective of Baseline Pulse Pressure: Subanalysis of the ACCOMPLISH Trial

Nabız Basıncı: Düşük 50 mmHg, Orta 64 mmHg, Yüksek 82 mmHg

TABLE III. Number of Events According to Tertiles of Pulse Pressure and Between-Tertile Hazard Ratios

	High vs Low	Medium vs Low	High vs Medium
CV mortality/nonfatal MI/nonfatal stroke	284 (7.2) vs 164 (4.4)	204 (5.4) vs 164 (4.4)	284 (7.2) vs 204 (5.4)
	1.48 (1.22–1.80)[a]	1.16 (0.94–1.42)	1.28 (1.07–1.54)[a]
All MI	136 (3.5) vs 64 (1.7)	84 (2.2) vs 64 (1.7)	136 (3.5) vs 84 (2.2)
	2.01 (1.48–2.73)[a]	1.29 (0.93–1.79)	1.56 (1.19–2.05)[a]
All stroke	104 (2.7) vs 66 (1.8)	75 (2.0) vs 66 (1.8)	104 (2.7) vs 75 (2.0)
	1.22 (0.89–1.78)	1.00 (0.72–1.40)	1.22 (0.91–1.65)

TABLE I. Baseline Characteristics of the Study Patients According to Tertiles of Pulse Pressure and Treatment

	Low Tertile (Mean PP=50.3 mm Hg) (<58 mm Hg)		Medium Tertile (Mean PP=63.9 mm Hg) (58–70.7 mm Hg)		High Tertile (Mean PP=82.2 mm Hg) (≥70.7 mm Hg)	
	B+A (n=1888)	B+H (n=1881)	B+A (n=1924)	B+H (n=1887)	B+A (n=1929)	B+H (n=1990)
Sex (male/female)	1213/675	1247/634	1175/749	1157/730	1059/870	1109/881
Mean age (y)	66.9 (6.49)	66.4 (6.36)	68.4 (6.70)	68.4 (6.74)	70.0 (7.02)	70.0 (6.97)
BMI (kg/m^2)	31.34 (6.09)	31.56 (6.31)	31.13 (6.30)	30.89 (6.20)	30.39 (6.24)	30.36 (6.11)
Antihypertensive treatment at start (yes)	1886	1874	1896	1857	1834	1914
SBP (mm Hg)	129.7 (11.9)	129.7 (11.4)	144.0 (11.2)	144.1 (11.2)	161.9 (15.1)	161.4 (14.7)
DBP (mm Hg)	80.3 (10.2)	80.6 (9.8)	80.1 (10.6)	80.3 (10.6)	79.9 (11.6)	79.0 (14.7)

Anti-HT Tedavi ve Nabız Basıncı

- **LIFE Çalışması: Losartan vs Atenolol**

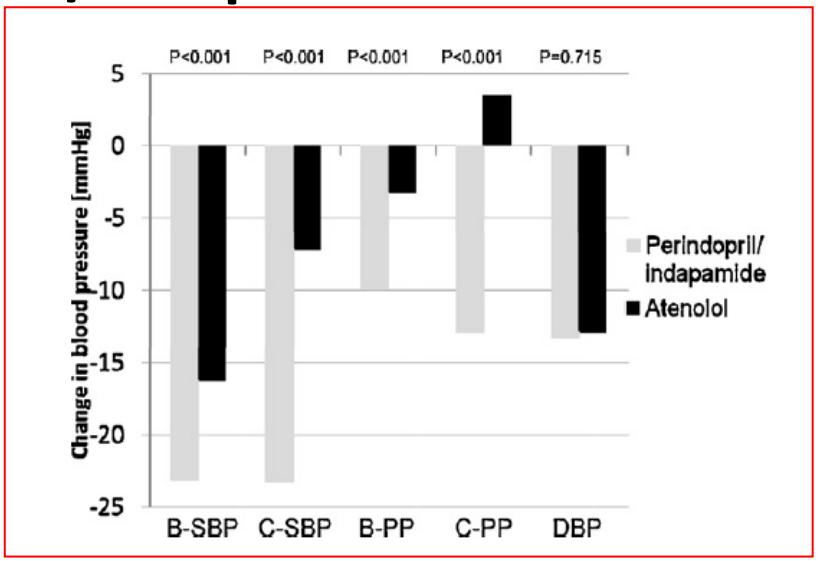
  Atenolol grubunda; PP artışı ile ; KVS olay ↑

- **ASCOT substudy CAFE : Amlodipin vs Atenolol**

  Atenolol ile, santral KB ve PP azalması az

- **REASON Çalışması : Perindo/Indap vs Atenolol**

  Perindopril/Indapamid ile PP azalması daha fazla



ACE inh ve KKB tercih edilebilir Klasik B-Blokerler UYGUN DEĞİL

Nabız Basıncı 60 mmHg

SKB:	110 mmHg
DKB:	– 50 mmHg
Nabız P:	60 mmHg

SKB:	130 mmHg
DKB:	70 mmHg
Nabız P:	60 mmHg

SKB:	139 mmHg
DKB:	79 mmHg
Nabız P:	60 mmHg

SKB:	149 mmHg
DKB:	89 mmHg
Nabız P:	60 mmHg

SKB:	180 mmHg
DKB:	120 mmHg
Nabız P:	60 mmHg

Nabız Basıncı

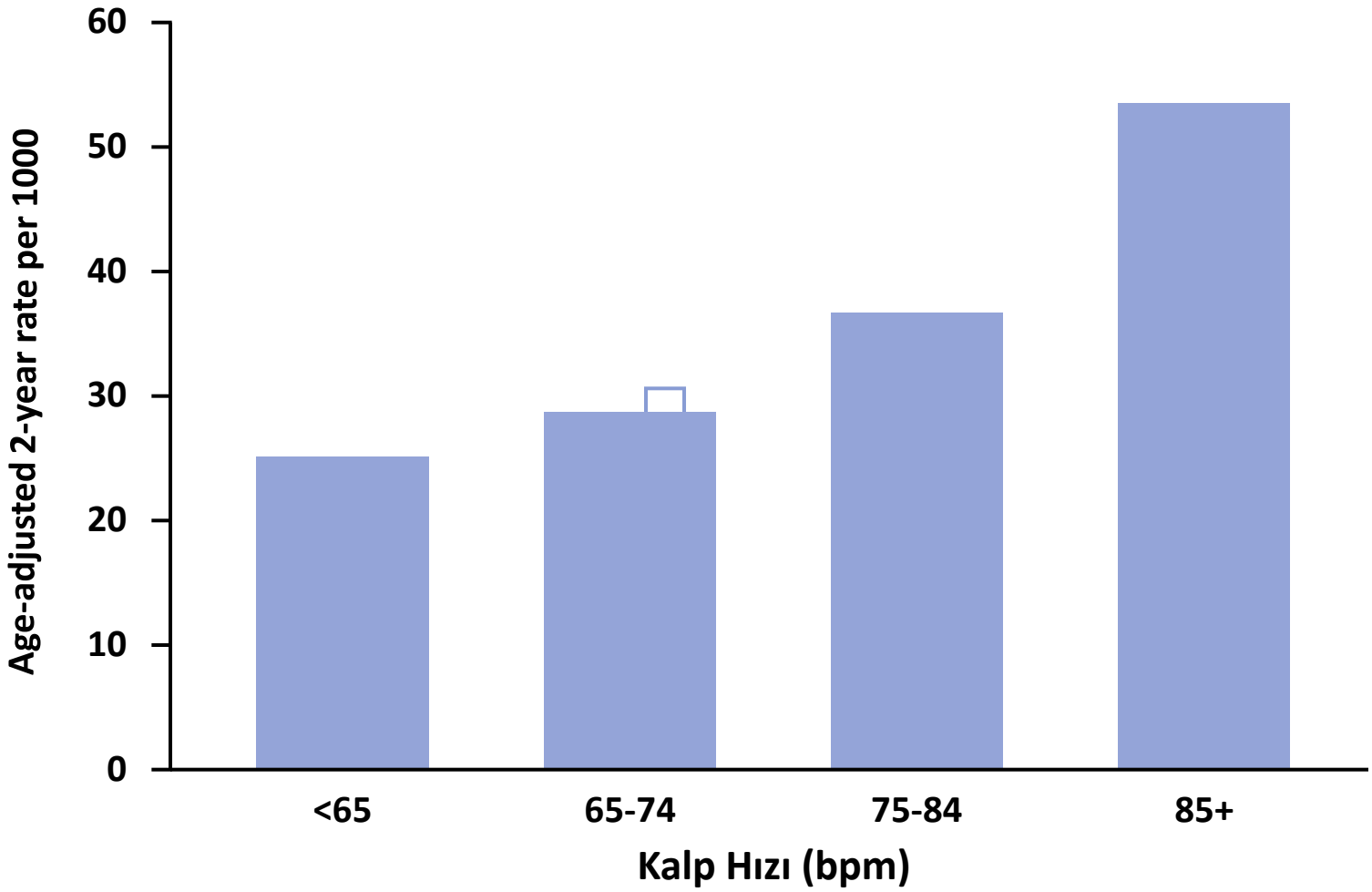
- **Anti-hipertansif ilaç seçiminde**
- **Anti-HT tedavi hedefi belirlemede**

➡**Nabız Basıncı kullanılması uygun değil**

Hipertansiyon ve Nabız Hızı

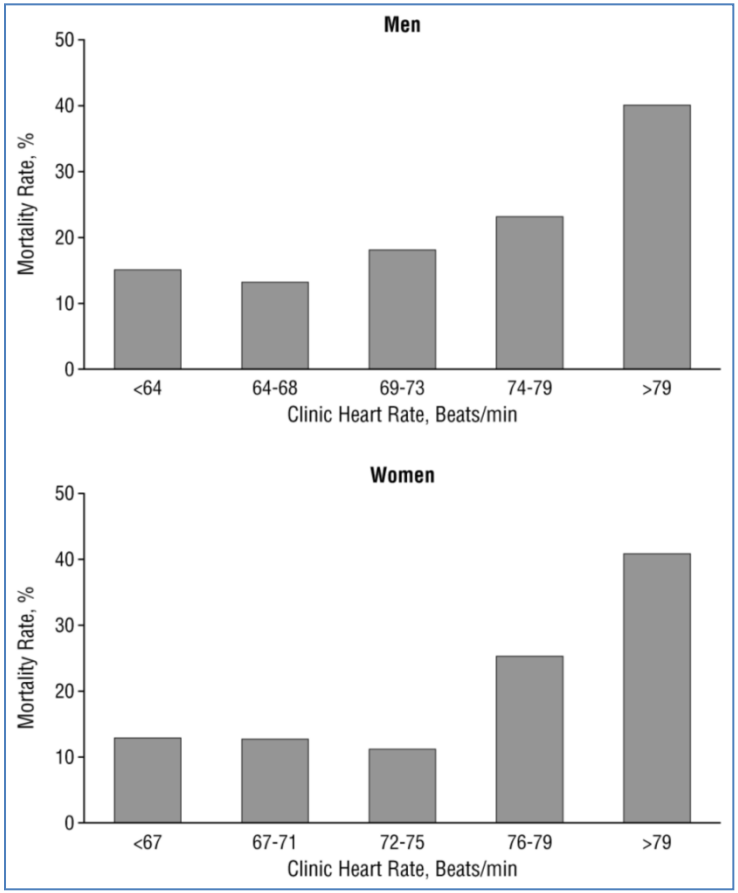
Hipertansiyonda Tüm Nedenlere Bağlı Ölüm için KALP HIZI Prediktör

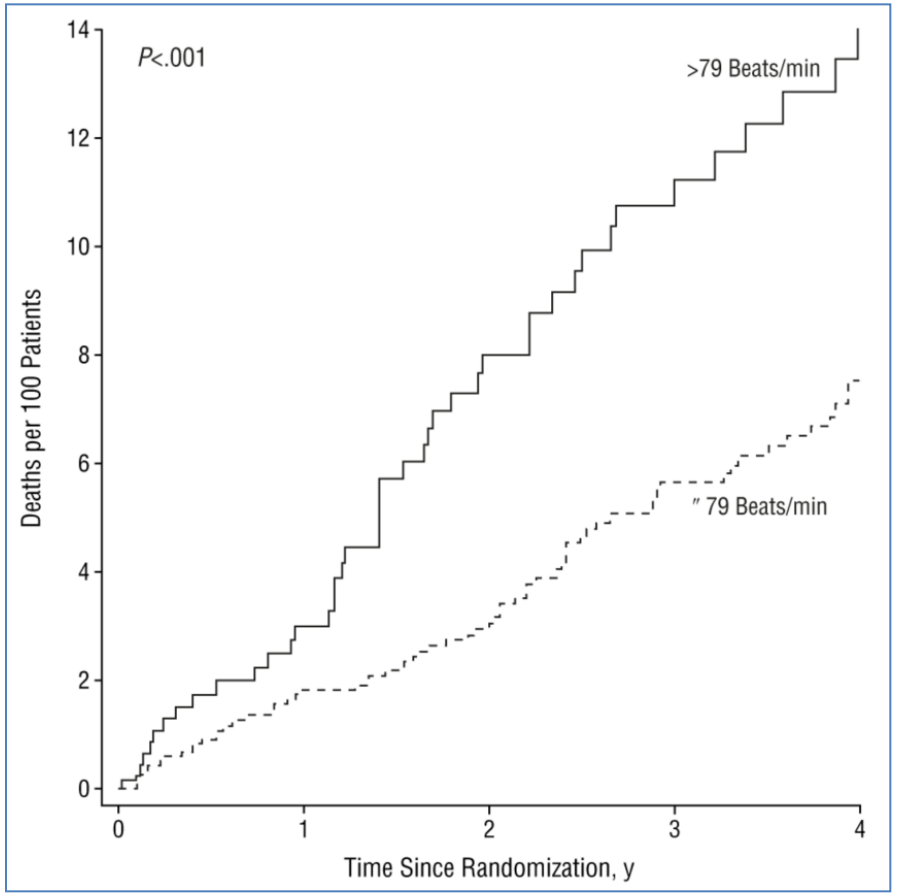
Framingham study, 2 037 erkek; 36-yıl takip; ECG



Gillman MW, et al. *Am Heart J.* 1993;125:1148-1154.

Yaşlı Sistolik HT Hastalarında Klinik Kalp Hızının Prediktif Değeri (Syst-Euro Çalışması)

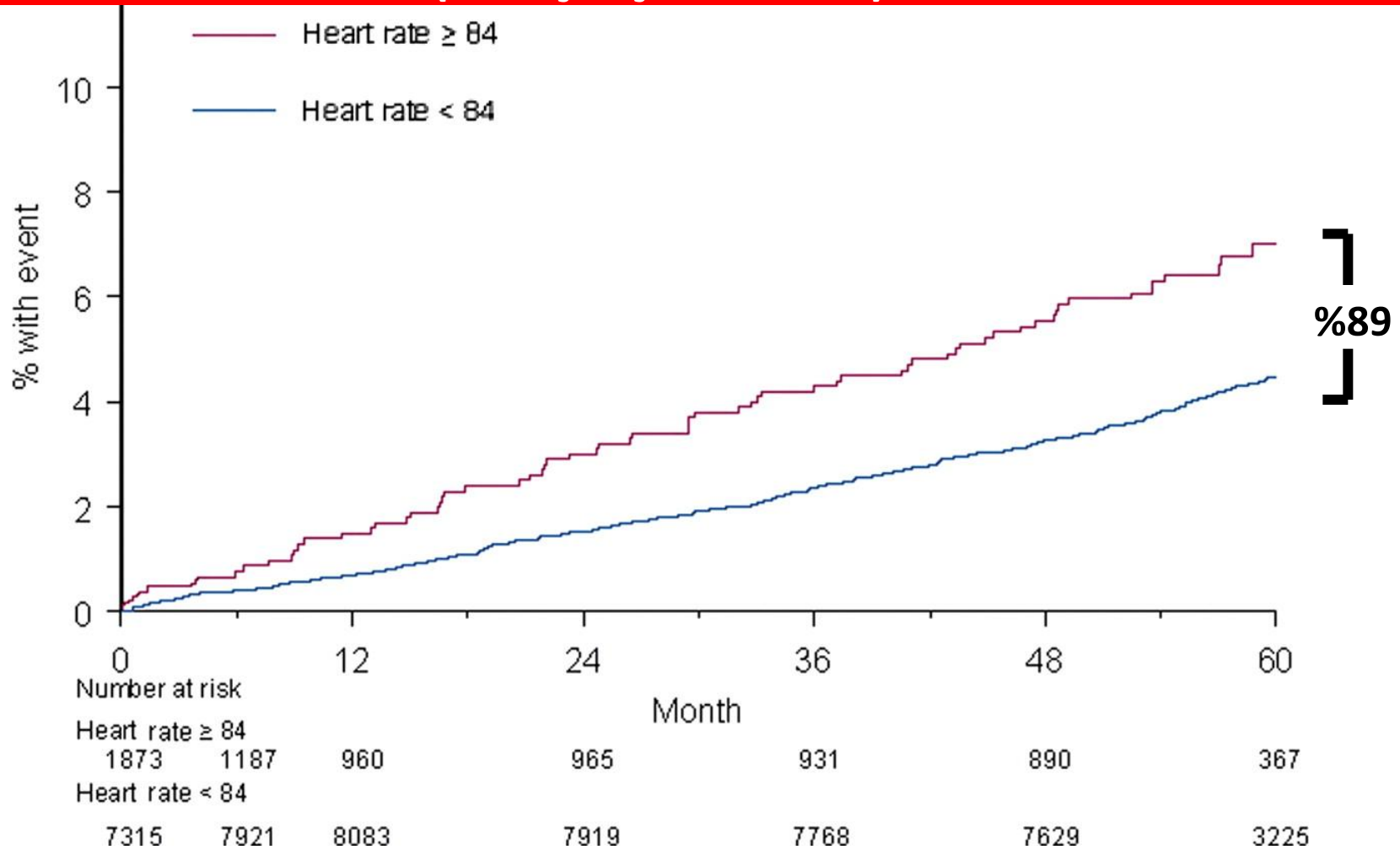




Predictive Value of Clinic and Ambulatory Heart Rate for Mortality in Elderly Subjects With Systolic Hypertension

Arch Intern Med. 2002;162(20):2313-2321.

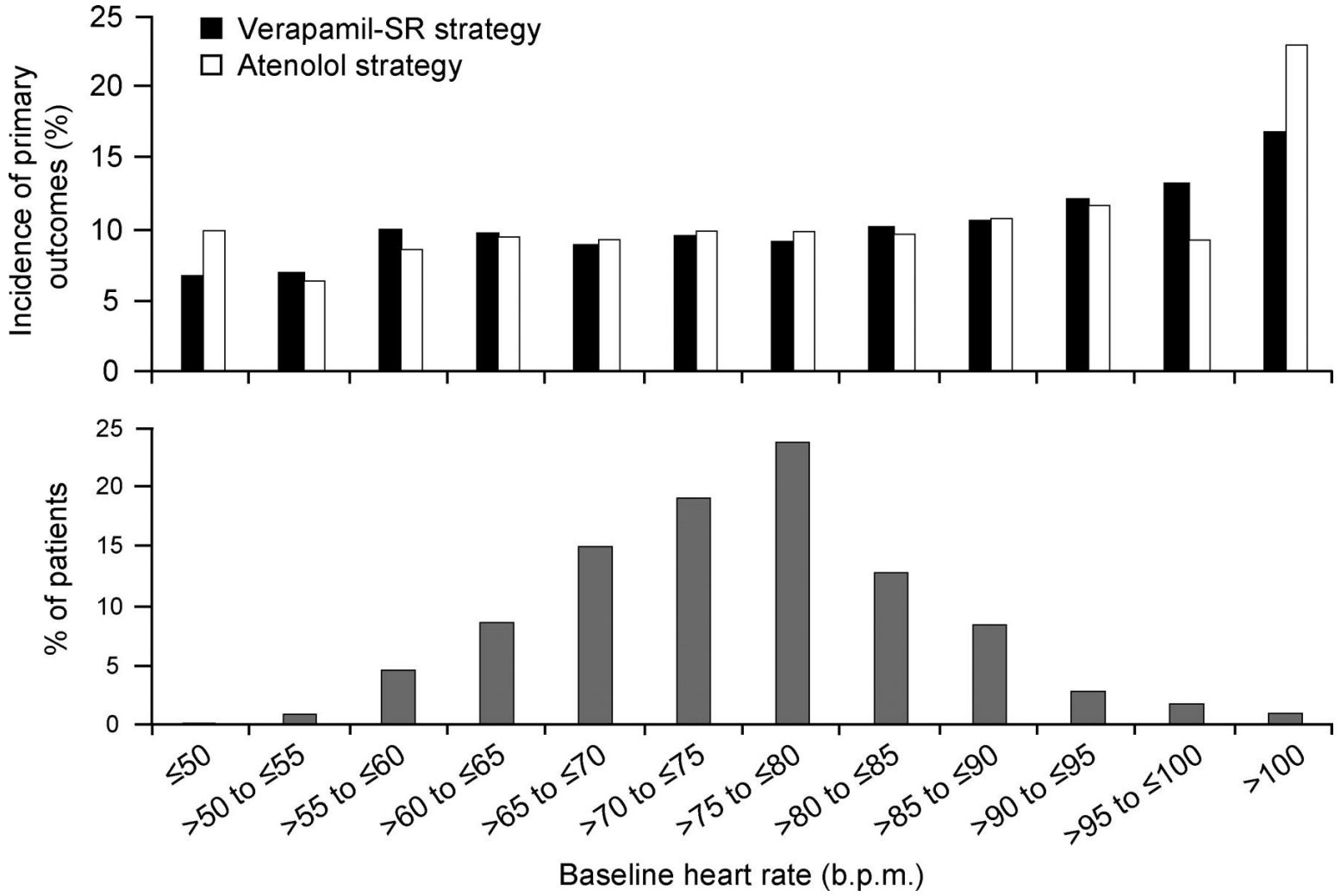
Hipertansif Hastalarda Tedavi Sırasındaki Kalp Hızı Değişikliği ve Mortalite (LIFE Çalışmasından)



All-cause and cardiovascular mortality in relation to changing heart rate during treatment of hypertensive patients with electrocardiographic left ventricular hypertrophy

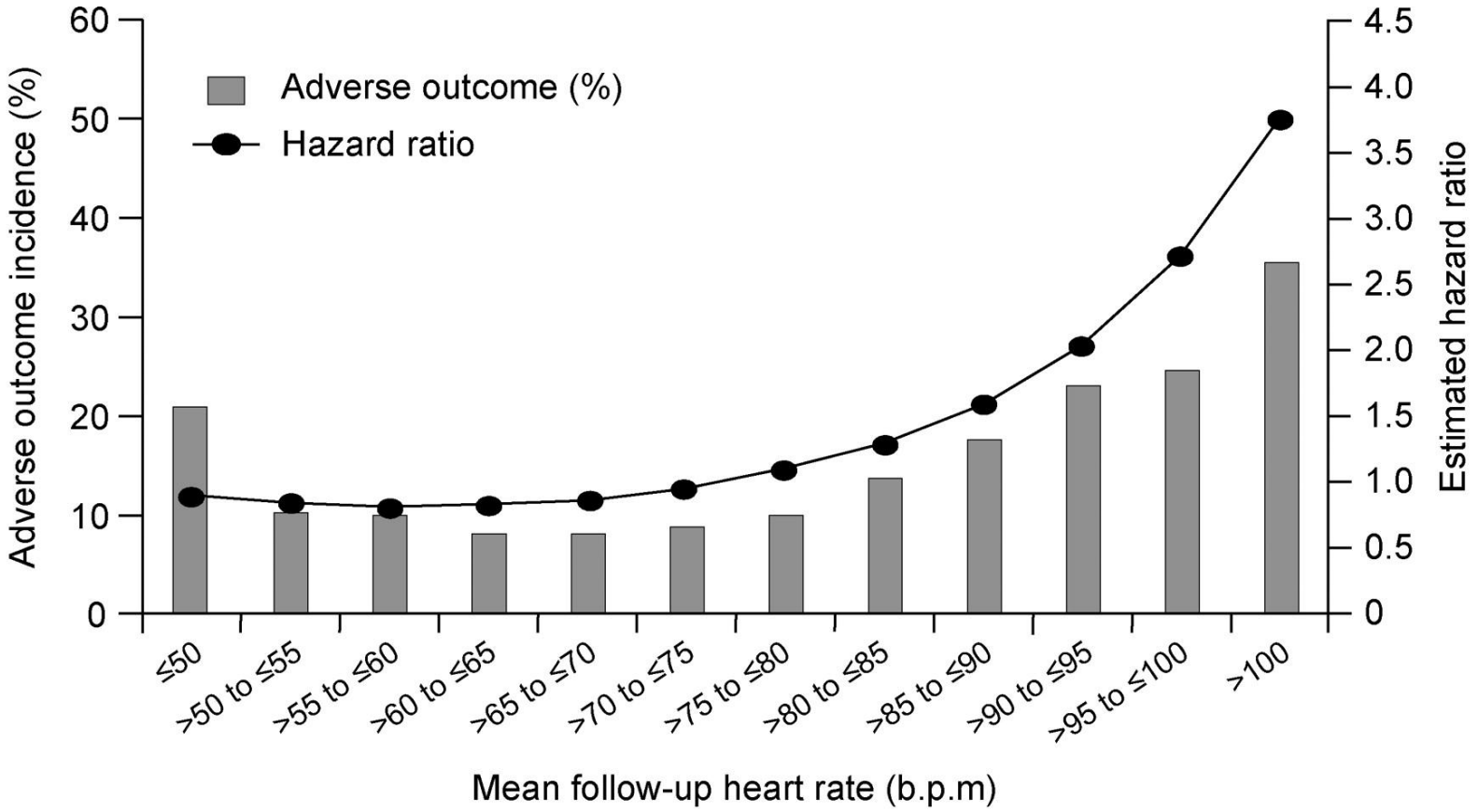
Okin P M et al. Eur Heart J 2010;31:2271-2279

Impact of resting heart rate on outcomes in hypertensive patients with coronary artery disease: INVEST Çalışması



Rainer Kolloch et al. Eur Heart J 2008;29:1327-1334

Tedavi sırasındaki İstirahat Kalp Hızı Kardiyovasküler Olaylar ile İlişkili

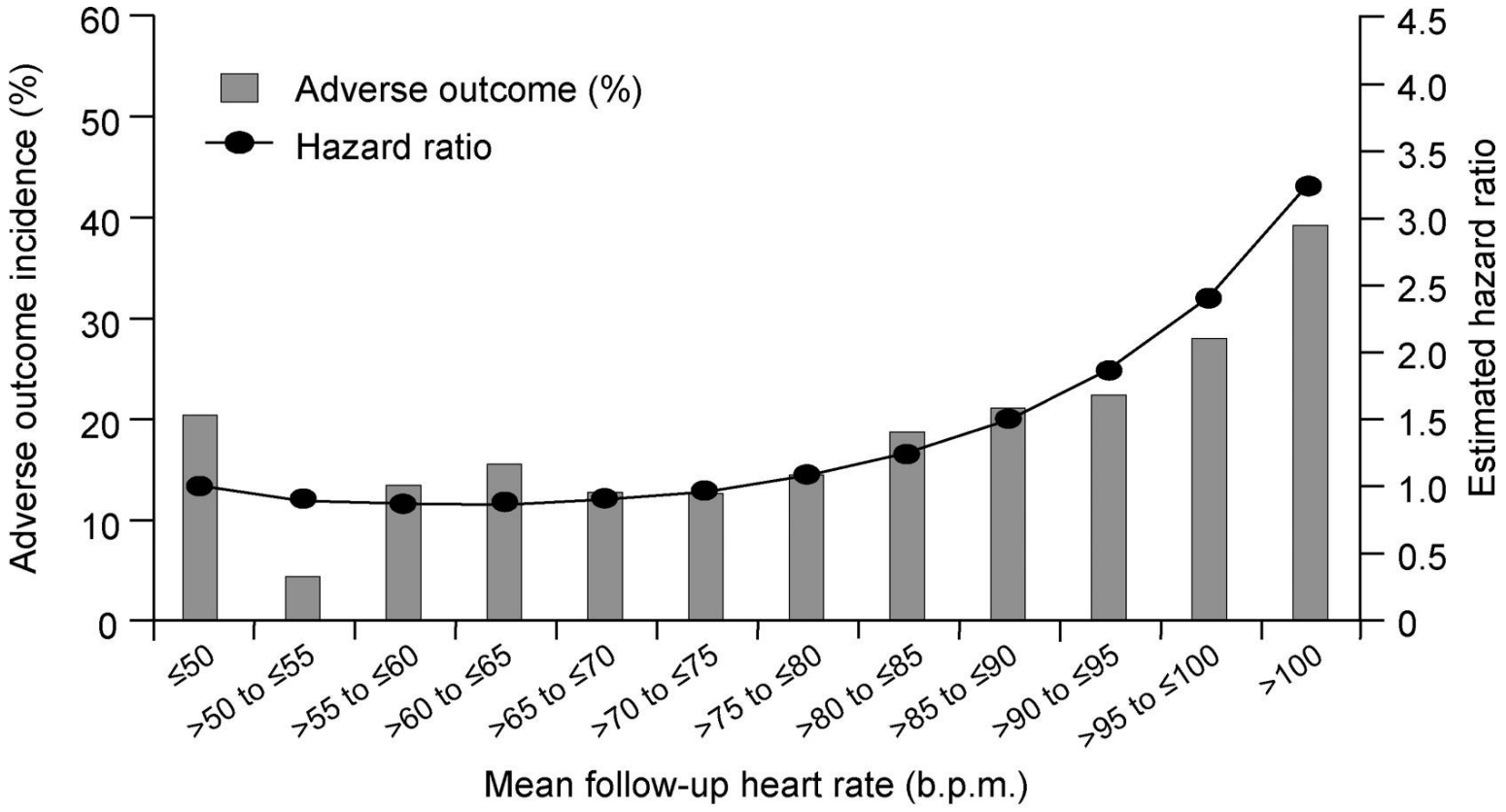


Total patients	38	192	949	2811	5092	6444	4238	1602	555	146	88	36

HR 70/dak vs 80/dak %31 ↑

Rainer Kolloch et al. Eur Heart J 2008;29:1327-1334

Diyabet Hastalarında
Tedavi sırasındaki İstirahat Kalp Hızı Kardiyovasküler Olaylar dile İlişkili



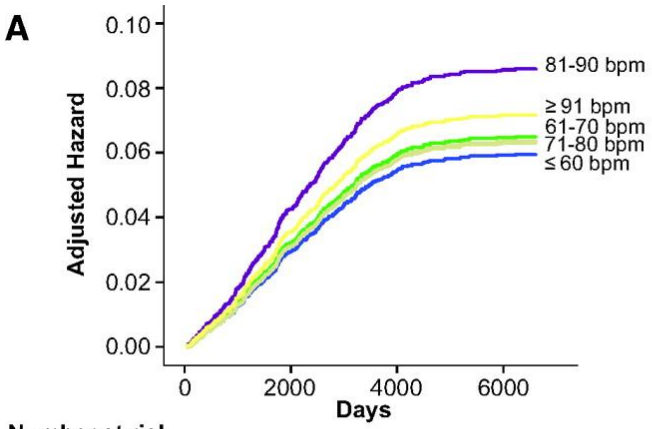
Diabetic patients	10	24	199	669	1317	1890	1309	575	200	55	33	13

Tedavi sırasındaki istirahat kalp hızı; KVS olay gelişimi ile ilişkilidir

Verapamil ile kalp hızı azalması daha az olduğu halde, Atenolol ile benzer etkinlik

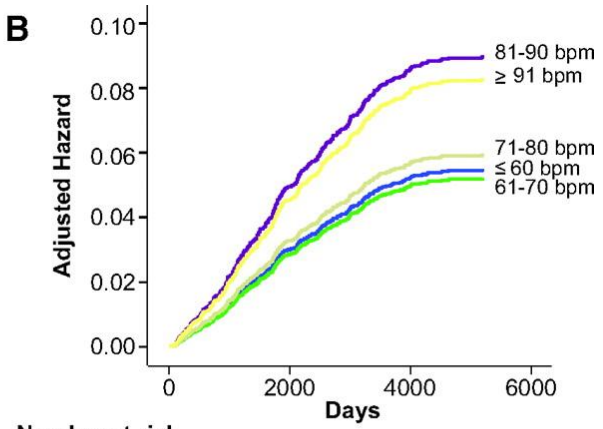
Hipertansif Hasta Takibinde Tedavi Sırasındaki İstirahat Kalp Hızı - Mortalite

Bazal Kalp Hızı



Number at risk

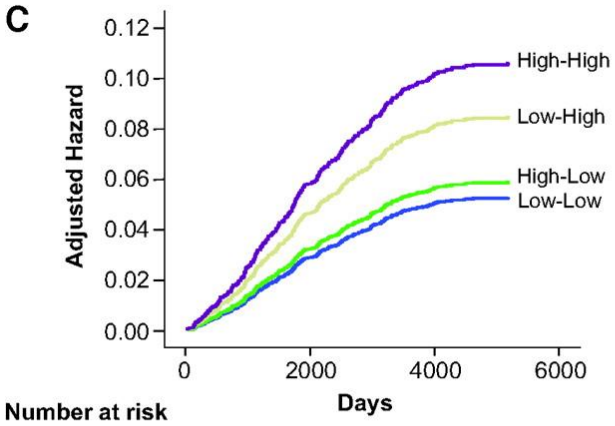
≤ 60 bpm	457	425	406	405
61-70 bpm	976	915	879	867
71-80 bpm	1242	1168	1126	1110
81-90 bpm	715	670	624	615
≥91 bpm	675	633	600	599



Number at risk

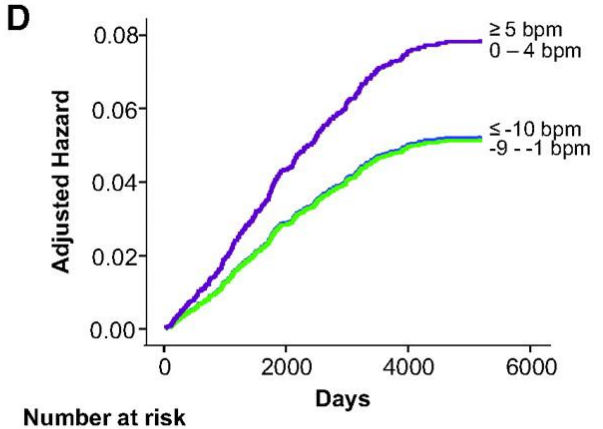
≤60 bpm	409	380	365	362
61-70 bpm	1081	1020	984	982
71-80 bpm	1069	995	961	958
81-90 bpm	463	425	396	392
≥91 bpm	342	314	294	290

Final Kalp Hızı



Number at risk

Low-Low	1966	1835	1779	1768
High-Low	593	560	531	531
Low-High	265	244	232	230
High-High	540	495	458	455



Number at risk

≤ -10 bpm	882	830	793	791
-9 - -1 bpm	800	750	724	721
0 – 4 bpm	953	881	839	834
≥ 5 bpm	729	673	644	638

HR artış

HR azalma

Resting Heart Rate Pattern During Follow-Up and Mortality in Hypertensive Patients

Paul L et al. Hypertension 2010;55:567-574

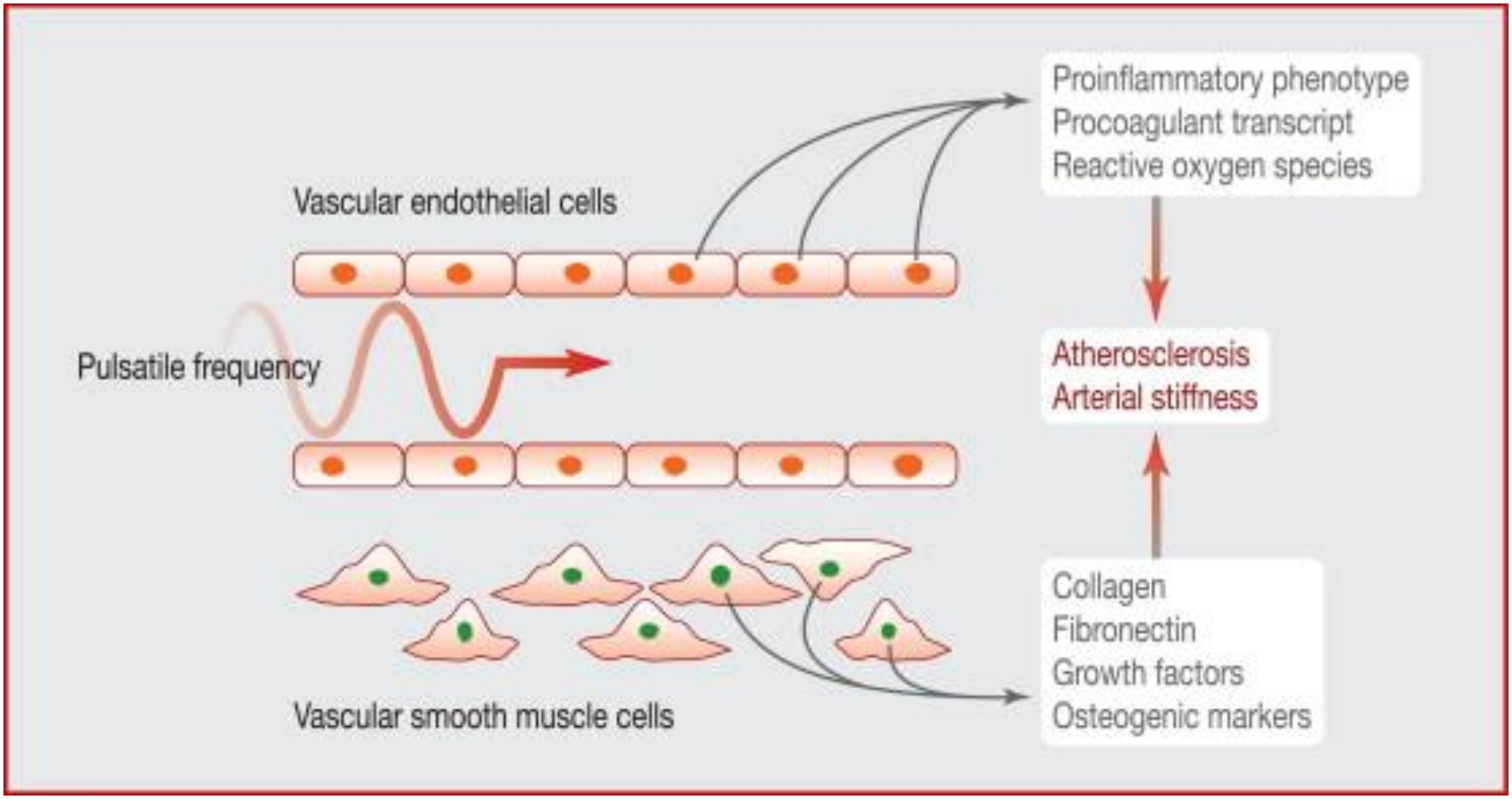
Yüksek Kalp Hızı Neden Kardiyovaskuler Riski Artırıyor?

Hipertansiyonda Sempatovagal Denge Bozulma

- ♥ Kalp hızı ↑

- ♥ Hedef Organ Hasarı (LVHT)
- ♥ Plt aktivitesi ↑
- ♥ Plasma TG, Kolestrol ↑
- ♥ Plasma İnsulin ↑
- ♥ Aritmi

Yüksek Kalp Hızı



Miyokard İskemisi ve Aritmi riski

Kalp hızının diğer risk faktörleri ile ilişkisi- Tromso Çalışması

>89/dk kalp hızı vs <60/dk olan hastalar

Erkek:

non-HDL kolesterol %14.5↑

Trigliserid %36.3 ↑

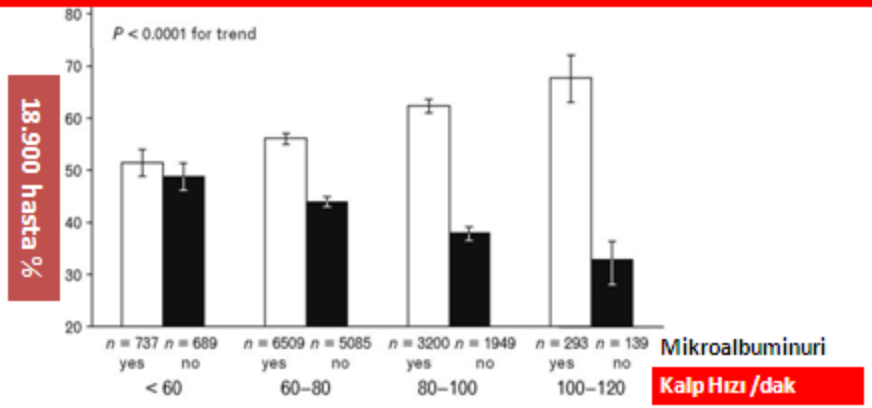
Kadın:

non-HDL kolesterol %12.5 ↑

Trigliserid %22.2 ↑

Bonaa ve Arnesen Circulation 1992

I-SEARH Çalışması: Kardiyovasküler Riskli Hastalarda Mikroalbuminuri-Kalp Hızı İlişkisi



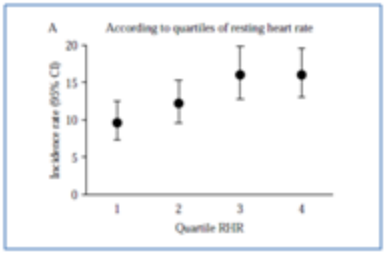
Prevalence of microalbuminuria according to heart rate classes is demonstrated and was globally tested using a Cochran–Mantel–Haenszel test. Heart rate considered as the original variable ($P < 0.0001$).

Risk of elevated resting heart rate on the development of type 2 diabetes in patients with clinically manifest vascular diseases. SMART Study Group.

Table 1 Baseline characteristics according to quartiles of resting heart rate (n=3646). The study population is presented in quartiles according to their resting heart rate.

	Quartile 1 (n=889)	Quartile 2 (n=965)	Quartile 3 (n=838)	Quartile 4 (n=954)
RHR (mean; bpm)	50±4	58±2	65±3	79±9

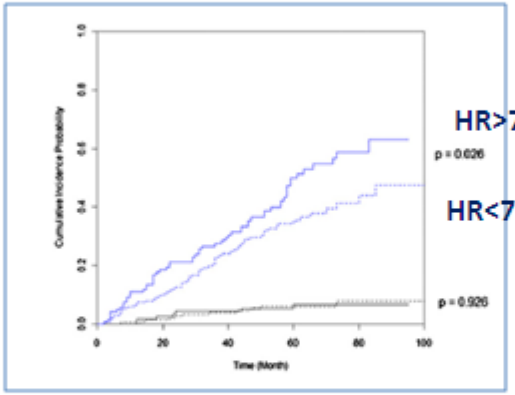
Yüksek kalp hızında, yavaş kalp hızına göre, DM gelişme riski %65 daha fazla



Dakikada her 10/dak kalp hızı artışı DM gelişme riskini %10 artırır.

Eur J Endocrinol. 2012 Apr;166(4):717-25.

Prognostic Value of Resting Heart Rate on Cardiovascular and Renal Outcomes in Type 2 Diabetic Patients: A competing risk analysis in a prospective cohort.



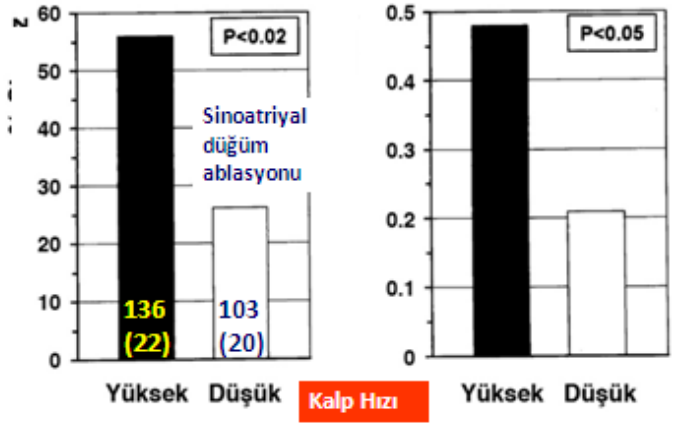
Kardiyovaskuler hastalığı olan diyabetiklerde, istirahat kalp hızı, kardiyovaskuler olay ve ölüm için artmış risktir (p<0.001)

Diabetes Care, volume 35, October 2012

Kalp hızı ve ateroskleroz: plak gelişimi

Kolesterolden zengin diyet

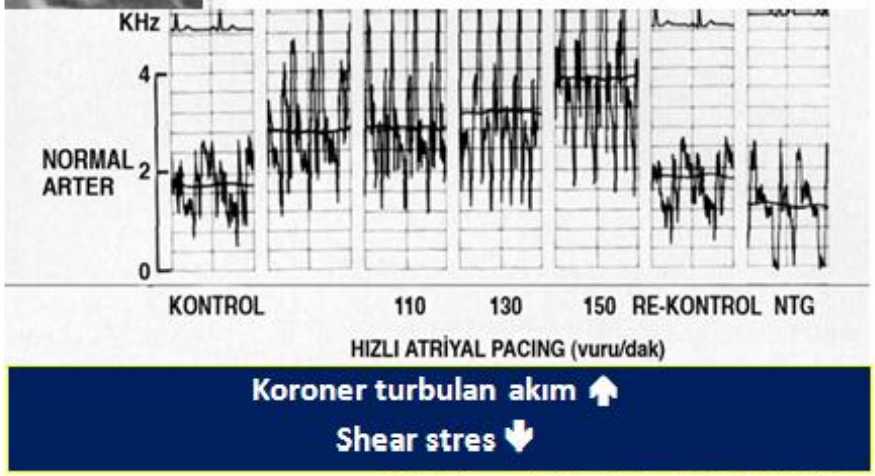
Babun



Beere PA, ve ark. *Science*. 1984;226:180-182.

Kalp hızı ve koroner kan akımı

Normal koroner arterler: koroner kan akımı hızları

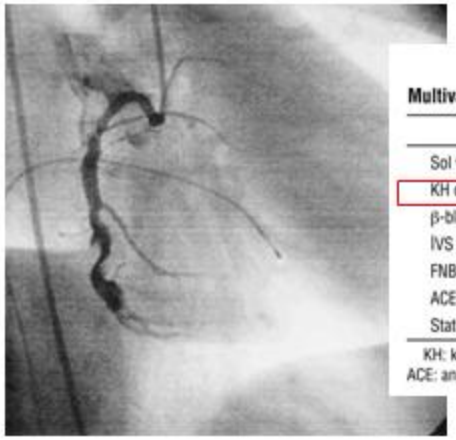


Koroner turbulan akım ↑

Shear stres ↓

Nobel EG, ve ark. *Circulation*. 1990;81:850-859

Kalp hızı ve ateroskleroz: koroner plak rüptürü



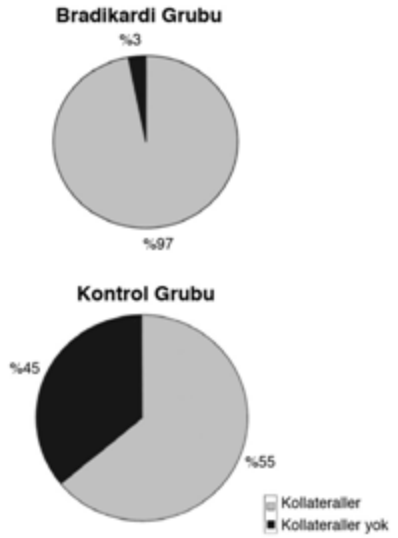
Koroner Plak Parçalanması ile İlişkileri Değerlendiren Multivaryant Analizi

	OR (%95 GA)	*P*
Sol ventrikül kitlesi >270 g	4.92 (1.83-13.25)	0.02
KH ortalaması >80 vuru/dak	3.19 (1.15-8.85)	0.02
β-bloker kullanımı	0.32 (0.13-0.88)	0.02
İVS duvar kalınlığı	1.68 (0.57-9.91)	0.06
FNB	1.81 (0.67-4.90)	0.07
ACE inhibitörleri	0.51 (0.19-1.34)	0.06
Statinler	0.42 (0.16-1.22)	0.06

KH: kalp hızı, İVS: interventriküler septum, FNB: fraksiyone nabız basıncı, ACE: anjiyotensin dönüştürücü enzim

Heidland UE, Strauer BE. *Circulation*. 2001;104:1477-1482.

Kalp hızı ve ateroskleroz: anjiyografik kollateraller



Kalp hızı <60 vuru/dak

Kalp hızı >60 vuru/dak

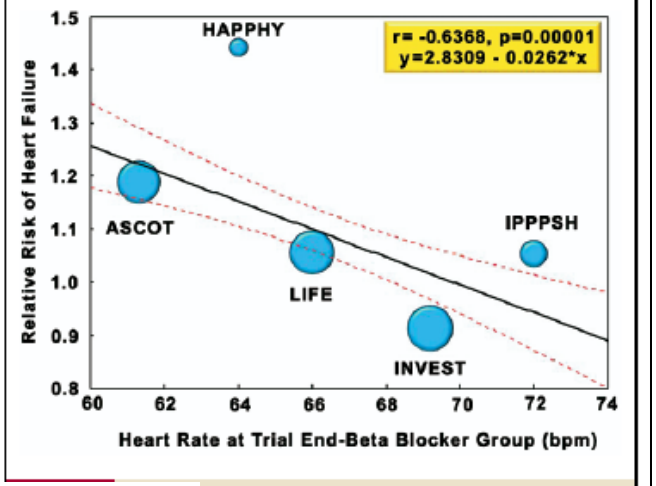
Patel SR, ve ark. *Coron Art Dis*. 2000;11:467-472.

Kalp Hızı Yüksek olan Hipertansiyon Hastalarında Ne Kullanalım ??

Hipertansiyonda Beta bloker kullanımı ile KALP Hızında azalma KARDİYOVASKULER OLAY VE ÖLÜM RİSKİNİ ARTTIRMAKTADIR.

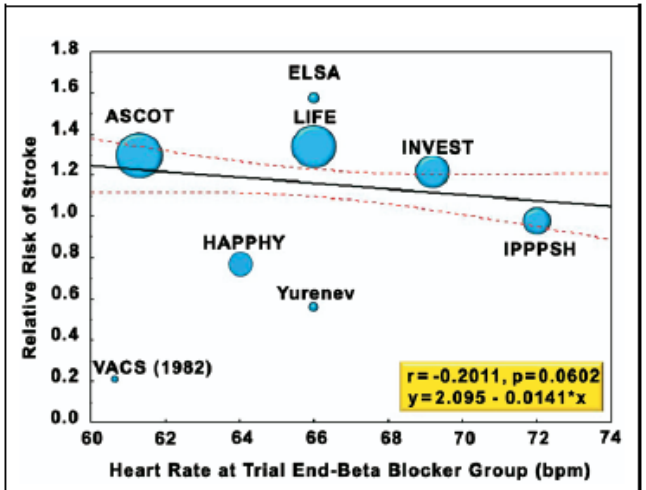
Conclusions In contrast to patients with myocardial infarction and heart failure, beta-blocker–associated reduction in heart rate increased the risk of cardiovascular events and death for hypertensive patients. (J Am Coll Cardiol 2008; 52:1482–9) © 2008 by the American College of Cardiology Foundation

Miyokard İnfarktüsü



KKY

KV Mortalite



İNME

The Effects of Dihydropyridine and Phenylalkylamine Calcium Antagonist Classes on Autonomic Function in Hypertension: The VAMPHYRE Study

Johan D. Lefrandt, Jörg Heitmann, Knut Sevre, Maurizio Castellano,

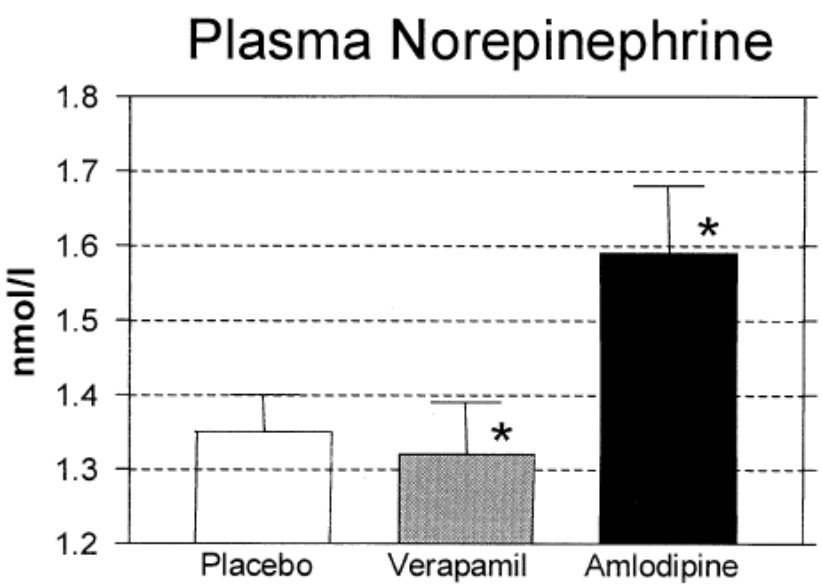
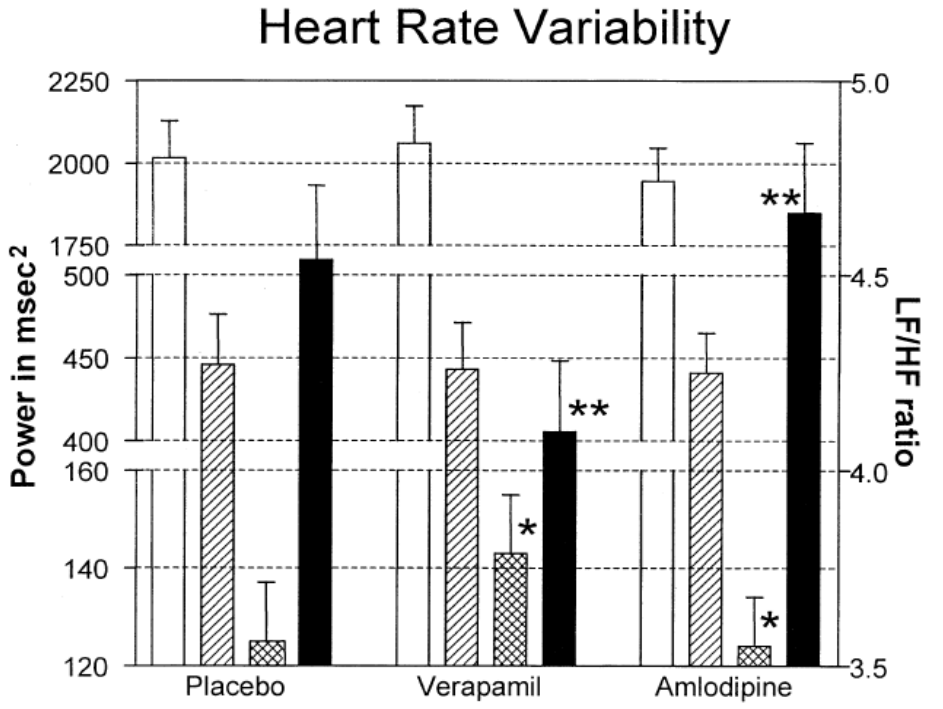


FIG. 2. Plasma norepinephrine before and after treatment with verapamil and amlodipine. Data given as mean (SEM). *$P < .001$ verapamil *v* amlodipine.



LF/HF oranı ↓ **BRS Düzelme**

Sempatik Aktivite ↓ **Parasempatik Aktivite ↑**

Sempatovagal dengede düzelme

Lefrandt JD, *et al*. *Am J Hypertens* 2001; 14: 1083-9.

Hipertansiyon ve Artmış Nabız Hızı TEDAVİSİ

- **KKB (Verapamil): Santral KB ↓**
  Santral PP ↓

Amlodipin vs Atenolol (Manistey CH et al. Hypertension 2009)

KKB ile Santral KB azalması ↑;

Kalp hızında azalmaya bağlı değil

Dalga yansıma indeksi (şiddeti) ↓

Vazodilator etki

Kalp Hızı

Hipertansiyon ➡ İstirahat kalp hızı ↑

İstirahat Kalp Hızı (>70/dak)

Tedavi sürecindeki HR↑

} **Kardiyovasküler risk↑**

} **ÖLÜM riski ↑**

<u>Kalp hızında 5/dak artış:</u>

- **KV ölüm %8 ↑**
- **MI %7 ↑**
- **Revask %8 ↑**
- **KKY %16 ↑**

2013 ESH/ESC Guidelines for the management of arterial hypertension

3.1 Bood pressure measurement

3.1.1 Office or clinic blood pressure

At present, BP can no longer be estimated using a mercury sphygmomanometer in many—although not all—European countries. Auscultatory or oscillometric semiautomatic sphygmomanometers are used instead. These devices should be validated according to standardized protocols and their accuracy should be checked periodically through calibration in a technical laboratory.[56] Measurement of BP at the upper arm is preferred and cuff and bladder dimensions should be adapted to the arm circumference. In the event of a significant (>10 mmHg) and consistent SBP difference between arms, which has been shown to carry an increased CV risk,[57] the arm with the higher BP values should be used. A between-arms difference is meaningful if demonstrated by simultaneous arm measurement; if one gets a difference between arms with sequential measurement, it could be due to BP variability. In elderly subjects, diabetic patients and in other conditions in which orthostatic hypotension may be frequent or suspected, it is recommended that BP be measured 1 min and 3 min after assumption of the standing position. Orthostatic hypotension—defined as a reduction in SBP of ≥20 mmHg or in DBP of ≥10 mmHg within 3 min of standing—has been shown to carry a worse prognosis for mortality and CV events.[58,59] If feasible, automated recording of multiple BP readings in the office with the patient seated in an isolated room, though providing less information overall, might be considered as a means to improve reproducibility and make office BP values closer to those provided by daytime ABPM or HBPM.[60,61] BP measurements should always be associated with measurement of heart rate, because resting heart rate values independently predict CV morbid or fatal events in several conditions, including hypertension.[62,63] Instructions for correct office BP measurements are summarized in *Table 5*.

KB ölçümü sırasında mutlaka KALP HIZI da ölçülmelidir, çünkü HT gibi çeşitli durumlarda KV olay ve mortalite ile ilişkilidir.

Table 5 Office blood pressure measurement

When measuring BP in the office, care should be taken:
• To allow the patients to sit for 3–5 minutes before beginning BP measurements.
• To take at least two BP measurements, in the sitting position, spaced 1–2 min apart, and additional measurements if the first two are quite different. Consider the average BP if deemed appropriate.
• To take repeated measurements of BP to improve accuracy in patients with arrhythmias, such as atrial fibrillation.
• To use a standard bladder (12–13 cm wide and 35 cm long), but have a larger and a smaller bladder available for large (arm circumference >32 cm) and thin arms, respectively.
• To have the cuff at the heart level, whatever the position of the patient.
• When adopting the auscultatory method, use phase I and V (disappearance) Korotkoff sounds to identify systolic and diastolic BP, respectively.
• To measure BP in both arms at first visit to detect possible differences. In this instance, take the arm with the higher value as the reference.
• To measure at the first visit, BP 1 and 3 min after assumption of the standing position in elderly subjects, diabetic patients, and in other conditions in which orthostatic hypotension may be frequent or suspected.
• To measure, in case of conventional BP measurement, heart rate by pulse palpation (at least 30 s) after the second measurement in the sitting position.

KB ölçümü sırasında KALP HIZI da (en az 30 sn) oturur pozisyonda ölçülmelidir

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Recommendations	Class[a]	Level[b]	Ref.[c]
It is recommended to obtain a comprehensive medical history and physical examination in all patients with hypertension to verify the diagnosis, detect causes of secondary hypertension, record CV risk factors, and to identify OD and other CVDs.	I	C	-
Obtaining a family history is recommended to investigate familial predisposition to hypertension and CVDs.	I	B	143, 144
Office BP is recommended for screening and diagnosis of hypertension.	I	B	3
It is recommended that the diagnosis of hypertension be based on at least two BP measurements per visit and on at least two visits.	I	C	-
It is recommended that all hypertensive patients undergo palpation of the pulse at rest to determine heart rate and to search for arrhythmias, especially atrial fibrillation.	I	[illegible]	62, 63
Out-of-office BP should be considered to confirm the diagnosis of hypertension, identify the type of hypertension, detect hypotensive episodes, and maximize prediction of CV risk.	IIa	B	89, 90, 103, 105, 109, 113, 117
For out-of-office BP measurements, ABPM or HBPM may be considered depending on indication, availability, ease, cost of use and, if appropriate, patient preference.	IIb	C	-

KALP HIZInı değerlendirmek için ve aritmi araştırmak için tüm HT hastalarında nabız palpasyonu yapılmalıdır.

Hipertansiyon ve Artmış Nabız Hızı TEDAVİSİ

- **HT; optimal istirahat kalp hızı net değil (<70-80/dak)**
- **Hipertansiyon; beta bloker tedavi (atenolol) ile kan basıncı ve kalp hızı azalmasına rağmen kardiyovaskuler olay/mortalite ↑**
- **Beta Blokerler; HT hastasında nabız hızını ve kan basıncını azaltmak için, uygun seçenek değil.**
- **Verapamil: Seçenek olabilir**

NABIZ HIZI:
Hipertansiyonda; kardiyovasküler olay ve mortalite ile ilişkilidir.

➔ Bazal İstirahat Nabız Hızı

➔ Tedavi sürecinde Nabız Hızı

Beni Türk Hekimlerine Emanet Ediniz