Paralisi ipokaliemica tireotossica

Una presentazione inusuale di una patologia comune

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Sig. M 39 aa

Anamnesi famigliare: madre diabetica, 1 sorella affetta da distiroidismo

Anamnesi fisiologica: coniugato, 3 figli in abs, magazziniere (cella frigo a – 30 °C), non fumatore, non bevitore, non assume liquirizia, possibile roncopatia

Allergie: non note

A.P.R: diabete mellito di tipo 2 in trattamento dietetico.

A.P.P.: recente reperto di PA 162/79 mmHg.

inviato dopo accesso al DEA per dolore toracico, tachicardia, paresi arti inferiori e ipostenia arti superiori, 160/80 mmHg, fc 91;

es. EE ipokaliemia severa 2 mmol/L → dopo KCl ev in infusione, dimesso con K+ 4,2 mmol/L). TSH < 0,01

Esame obiettivo

- buone condizioni generali
- **PA 150/80 (media su 3 rilevazioni) braccio sx**
- **in ortostasi PA 140/75 mmHg**
- Peso 75 Kg; h 170 cm
- toni cardiaci validi, ritmici, tachifrequenti (100/min), impurità sistolica
- torace MV ubiquitario, non rumori patologici
- addome globoso trattabile, non dolente né dolorabile, fegato a 2 cm dall'arcata costale, milza non palpabile
- arterie normoisosfigmiche, non soffi patologici udibili
- non edemi declivi
- **Tiroide soffice, non dolorabile**
- **Fini tremori arti superiori**

- **Riferisce calo ponderale di alcuni Kg negli ultimi tempi ed insonnia**

Terapia in atto (dal DEA): KCL 600 mg 2 cp x 2

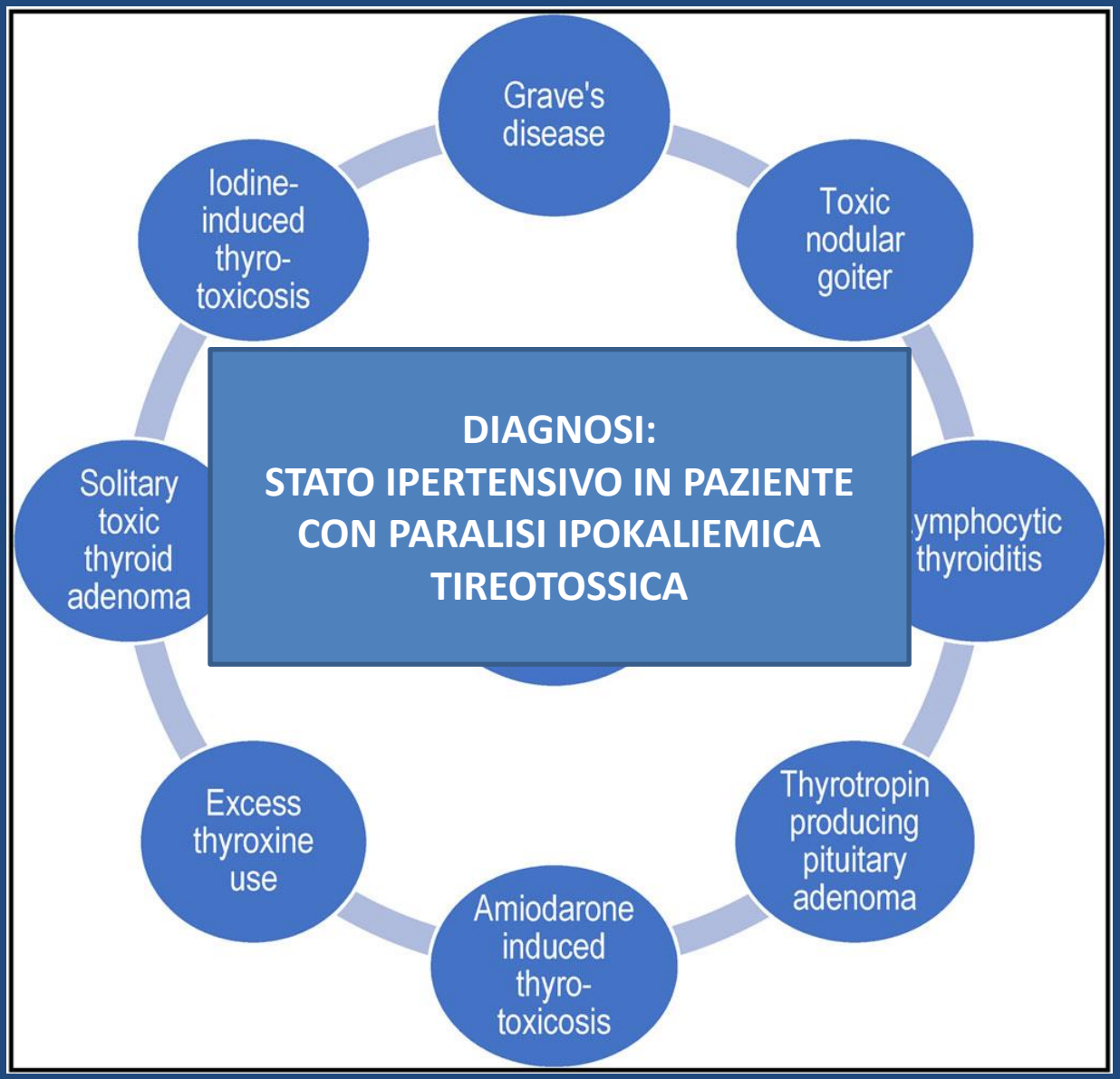
Esami eseguiti:

- K+ 4,2, Na+ 138 mmol/L TSH < 0.010, **fT4 43,6 (v.n. 7,6 -14,6 ng/L), fT3 20,52 ng/L**

- ECG: ritmo sinusale a 106/min, alterazioni della ripolarizzazione verosimilmente secondarie ad ipokaliemia

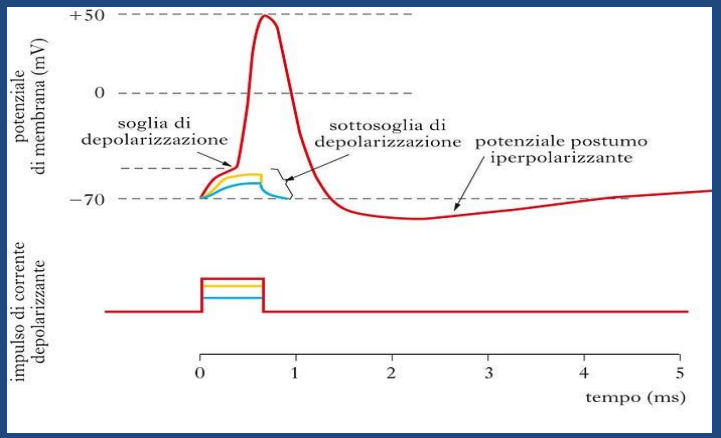
TRAb 3,5 U/L (v.n. < 1,8)
AbTPO 493 U/L (v.n. < 35)
AbTG < 20 (v.n. <40)

IPERTIROIDISMO AUTOIMMUNE (M DI BASEDOW)

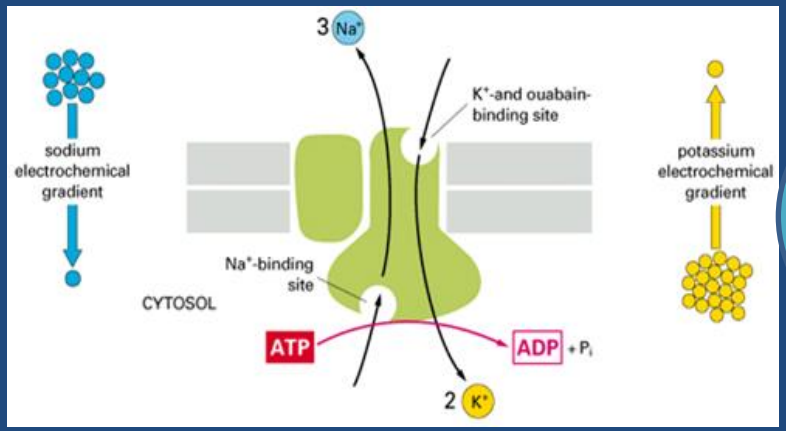

Grave's disease
Toxic nodular goiter
ymphocytic thyroiditis
Thyrotropin producing pituitary adenoma
Amiodarone induced thyro-toxicosis
Excess thyroxine use
Solitary toxic thyroid adenoma
Iodine-induced thyro-toxicosis
DIAGNOSI:
STATO IPERTENSIVO IN PAZIENTE CON PARALISI IPOKALIEMICA TIREOTOSSICA

Paralisi ipokaliemica tireotossica

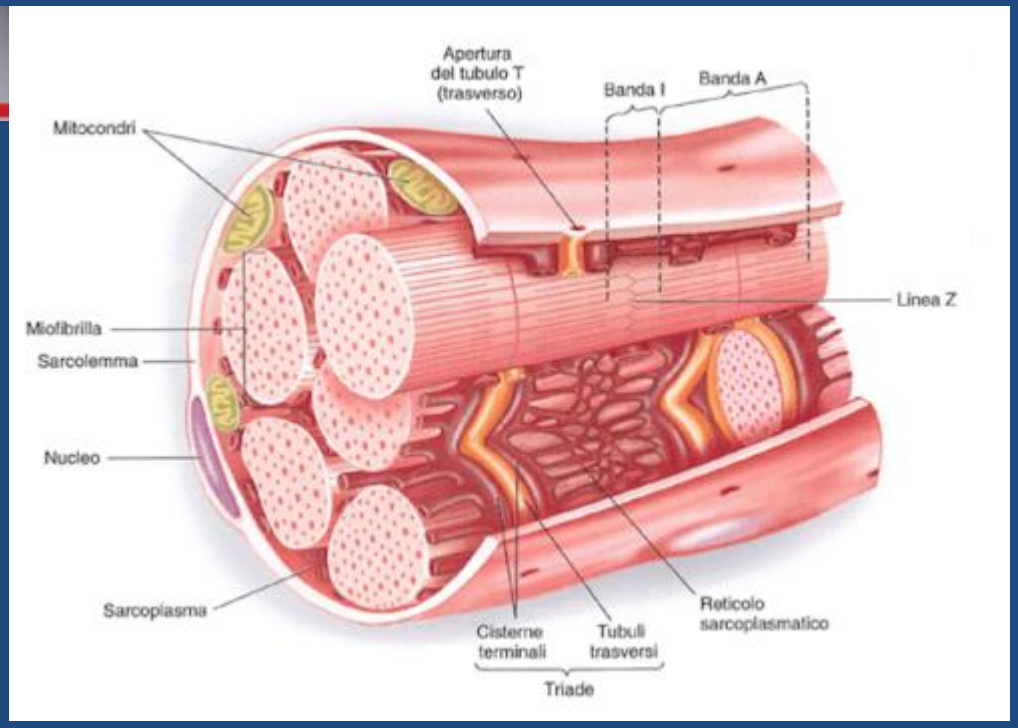
- Rara causa di astenia muscolare acuta
- Maschi > femmine (17:1 –> 70:1)
- 20 - 40 aa
- No storia famigliare di paralisi periodica
- Qualsiasi forma di ipertiroidismo > Basedow
- Prevalente negli Asiatici
- Spesso sfumati /assenti segni di tireotossicosi (problemi dg)
- Prevalente al mattino
- Base ereditaria: nel 33% mutazioni gene KCNJ2 sensibile ad ormoni tiroidei codifica Kir, prot correlata ai canali muscolari scheletrici del K+ - inoltre polimorfismi CACNA1S e GABRA3

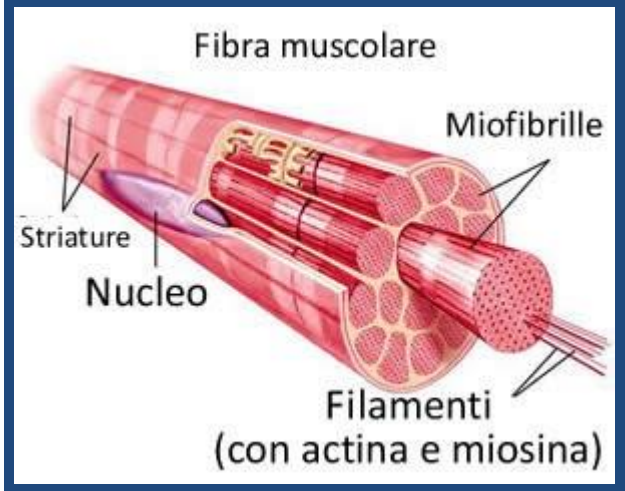


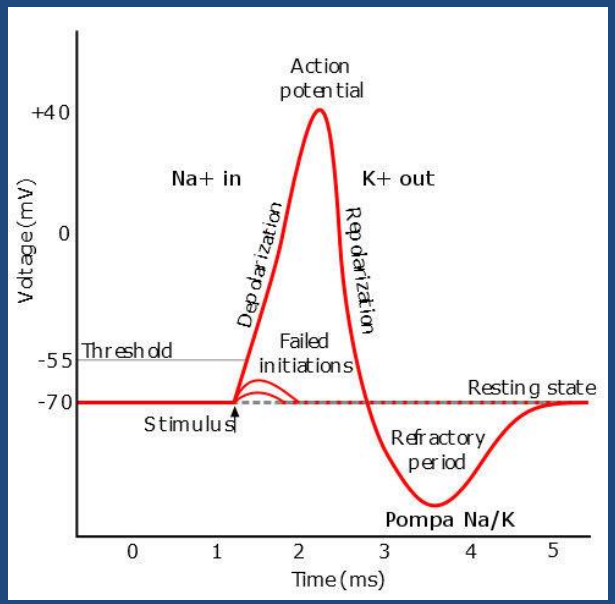
STIMOLATA DA:
- Ormoni tiroidei
- Catecolamine
- Attività beta adren
- Androgeni
- insulina



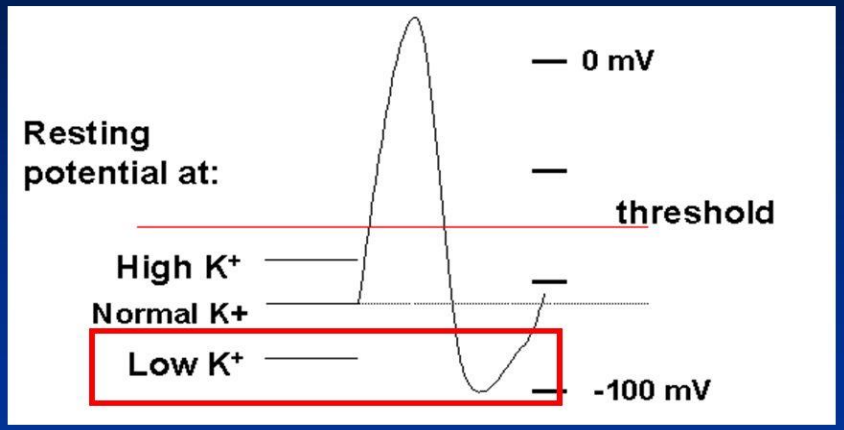
INIBITA DA:
- ESTROGENI
- BETA B (indir.)
- - Cn-
- ouabaina







Effetti dell'ipopotassiemia sul potenziale d'azione: minore eccitabilità cellulare (singola cellula)



Trattamento

- Correzione della Kaliemia (ev e per os): prevenzione aritmie e recupero stenia muscolare
- Attenzione a rebound iperk+ (40%) se infusione di KCl > 90 meq in < 24 ore!!
- Propranololo (blocco stimolazione adrenergica di Na+/K+ ATPasi)
- Farmaci antitiroidei
- Eventuali radioiodio o tiroidectomia

Terapia consigliata:
metimazolo 5 mg 1 cp x 3
inderal 40 mg 1 cp x 2
Kcl retard 600 mg 1 cp x 3

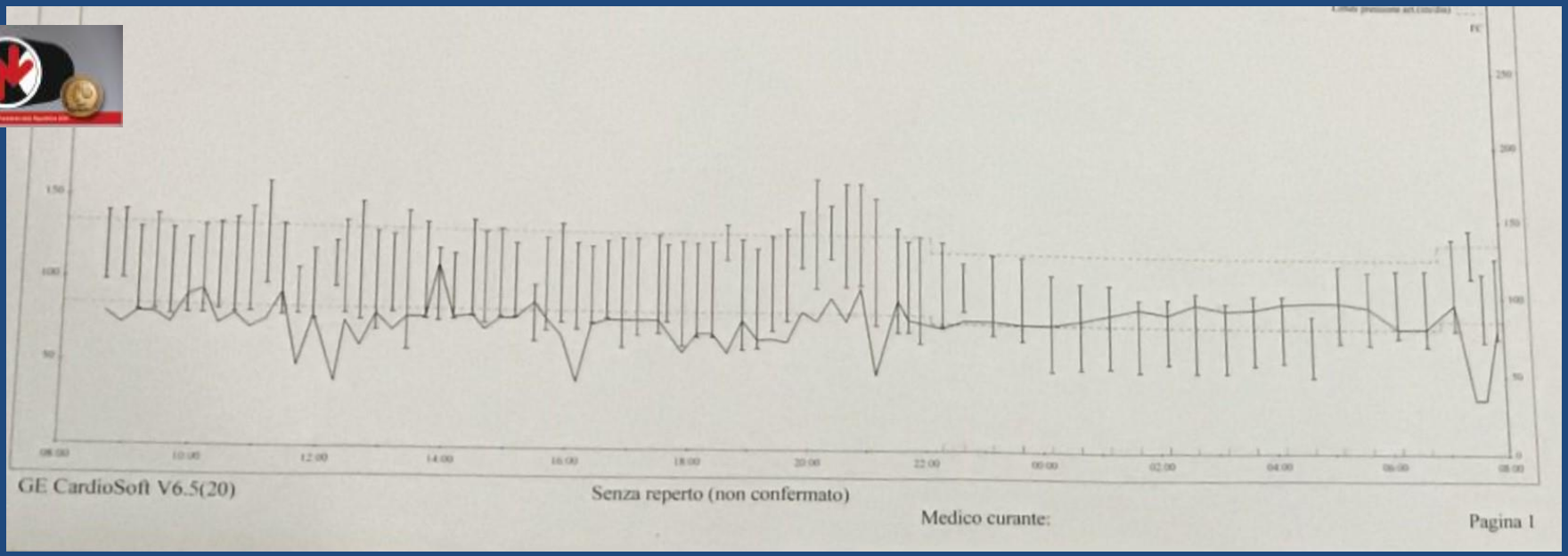
Table 4. Beta-Adrenergic Receptor Blockade in the Treatment of Thyrotoxicosis

Drug	Dosage	Frequency	Considerations
Propanolol[a]	10–40 mg	TID QID	Nonselective beta-adrenergic receptor
			oses
Atenolol			
Metopro			
Nadolol			
			Least experience to date
			May block T_4 to T_3 conversion at high doses
Esmolol	IV pump 50–100 μg/kg/min		In intensive care unit setting of severe thyrotoxicosis or storm

Each of these drugs has been approved for treatment of cardiovascular diseases, but to date none has been approved for the treatment of thyrotoxicosis.

Beta-adrenergic blockade should be considered in all patients with symptomatic thyrotoxicosis.
In patients in whom the diagnosis of thyrotoxicosis is strongly suspected or confirmed, treatment with propranolol, atenolol, metoprolol, or other beta-blockers leads to a decrease in heart rate, systolic blood pressure, muscle weakness, and tremor, as well as improvement in the degree of irritability, emotional lability, and exercise intolerance

Bahn et al; Thyroid 2011



- Medie sisto-diastoliche delle 24 ore oltre i limiti di riferimento (PA 129,8/76,8)
- Fasi di veglia: medie sistoliche oltre i limiti e diastoliche nei limiti di riferimento (PA 136/81 mmHg)
- Medie notturne: nei limiti (PA 110/62 mmHg), dipping presente (caduta pressoria notturna- 19%)

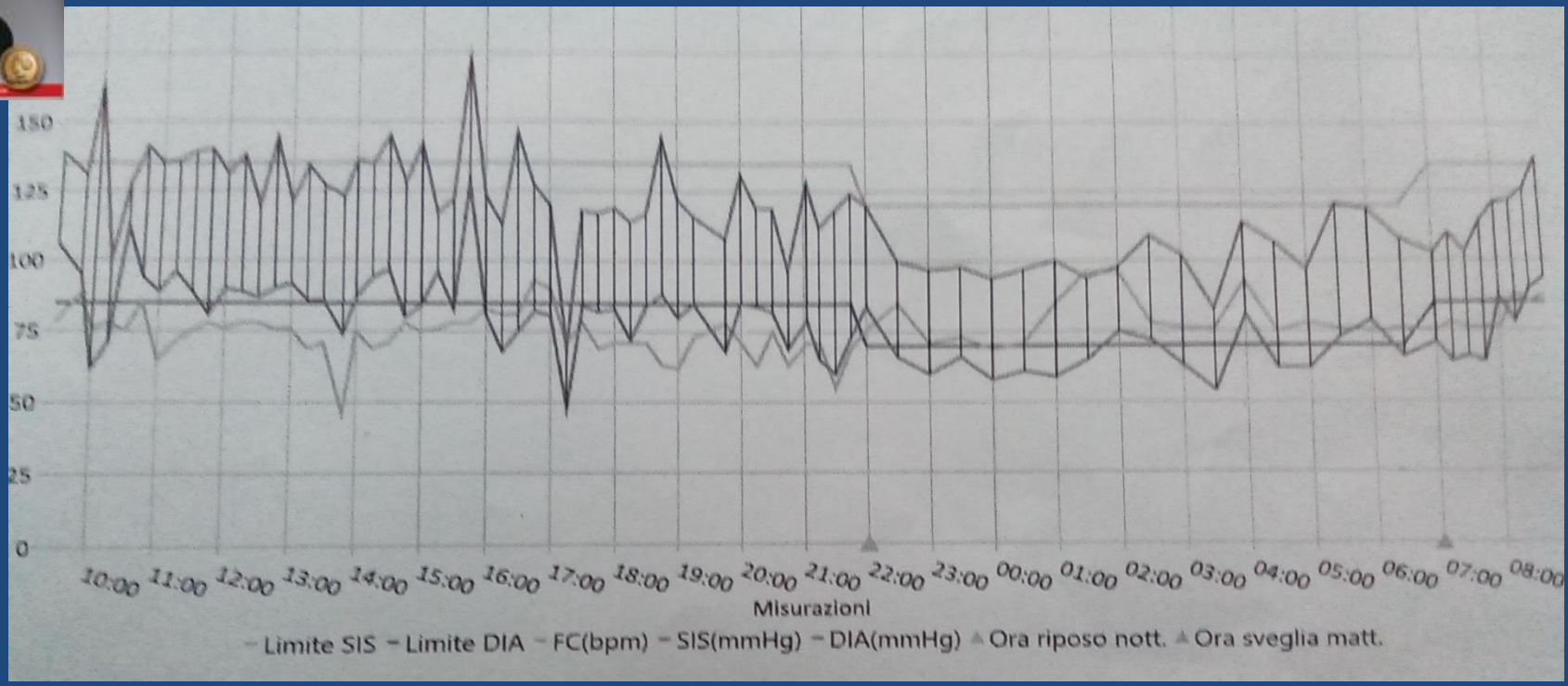
- Con propranololo 40 mg x 2 e metimazolo 5 mg x 3

TSH < 0.10, fT4 39,6

Nel corso del mese successivo …

- Rapido rientro della PA nei limiti di riferimento
- 120/70 mmHg
- in ortostasi PA 120/80 mmHg

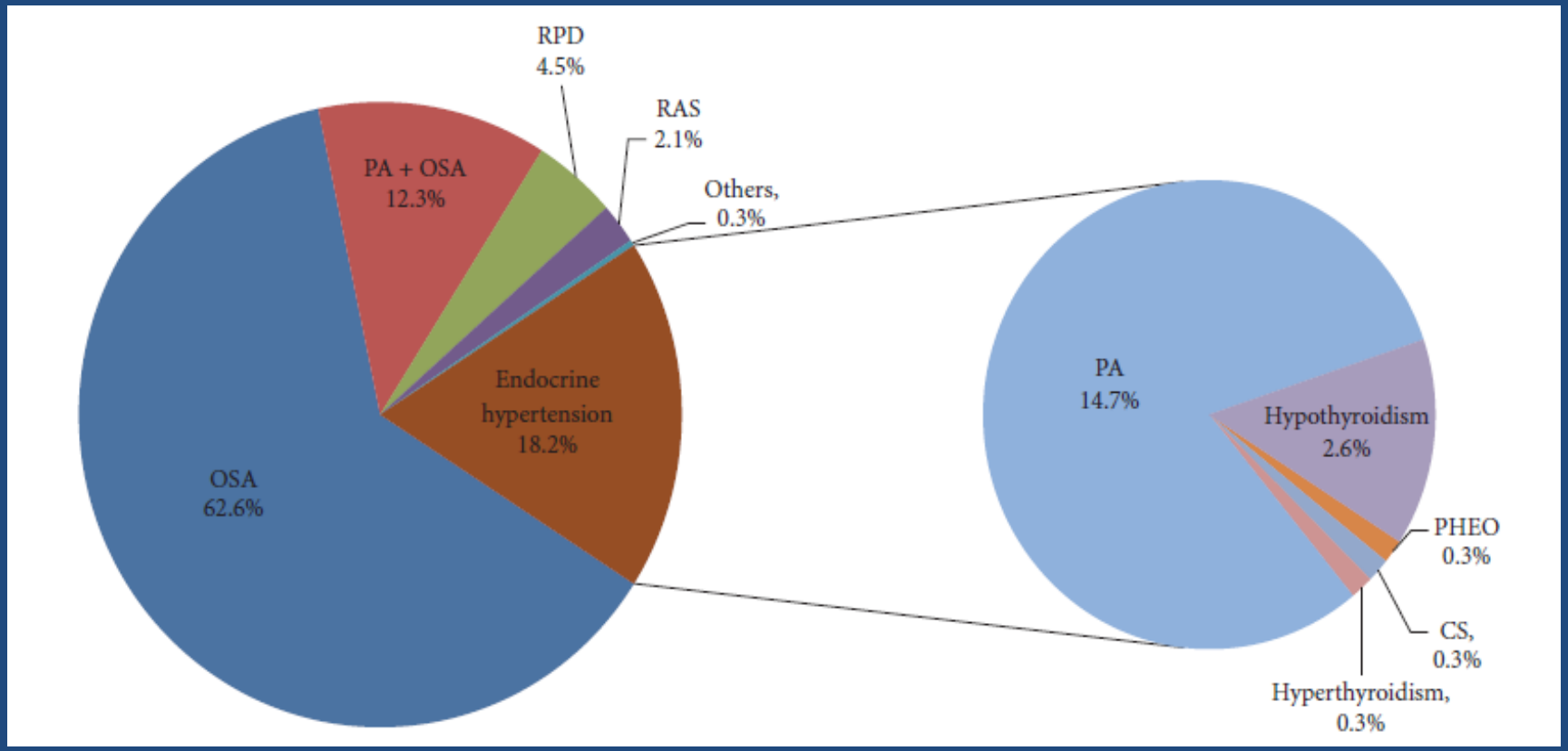
- F-U con rimodulazione di KCL per os e necessità episodica di integrazione con KCL ev + $MgSO_4$ → fino a graduale sospensione in alcuni mesi



- Medie sisto-diastoliche delle 24 ore oltre i limiti di riferimento (PA 120/78,8)
- Fasi di veglia: medie sistliche oltre i limti e diastoliche nei limiti di riferimento (PA 125,3/82,6 mmHg)
- Medie nottturne: nei limiti (PA 103,2/67 mmHg), dipping presente (caduta pressoria notturna- 19%)

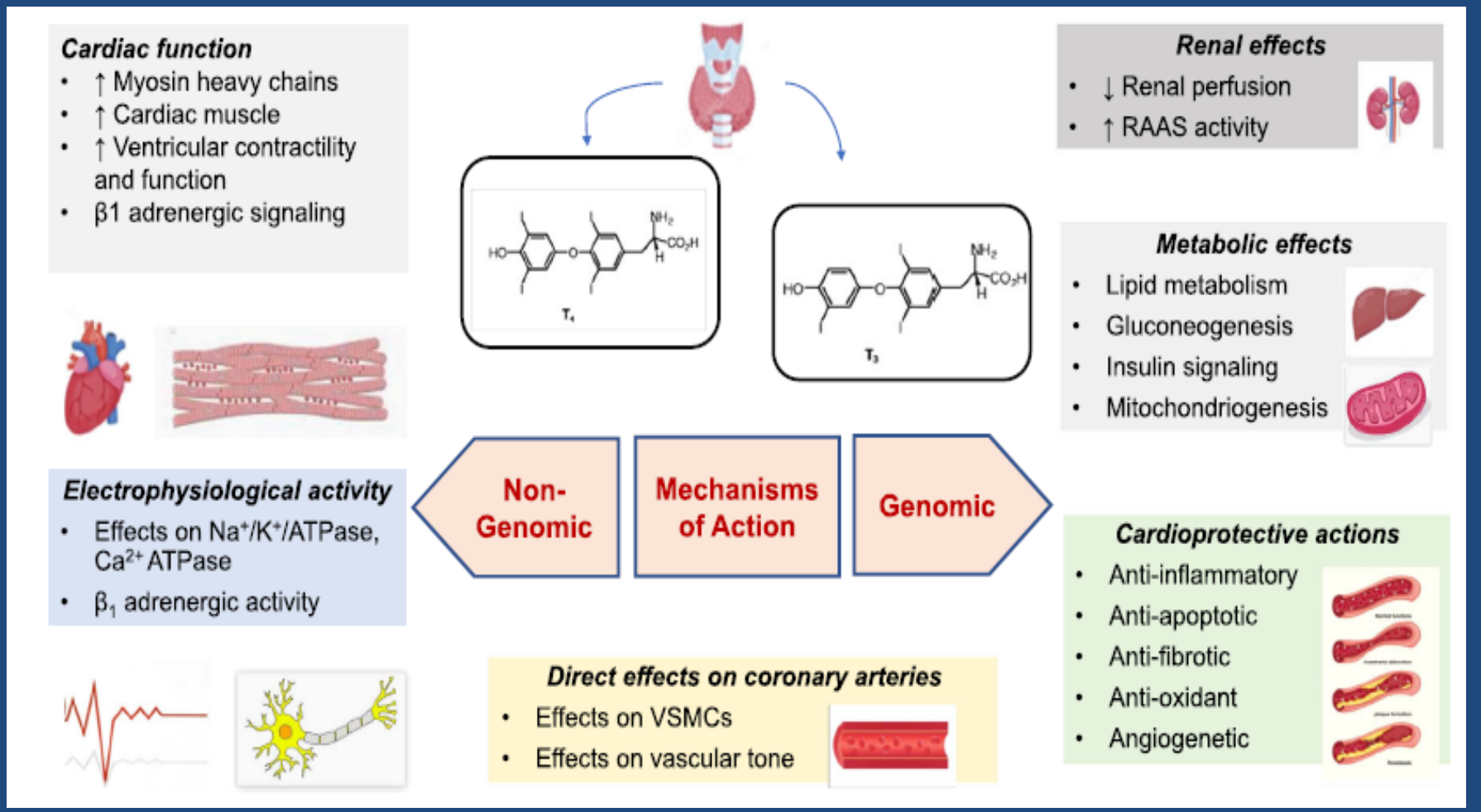
earch Article

Detection of Secondary Causes and Coexisting Diseases in Hypertensive Patients: OSA and PA Are the Common Causes Associated with Hypertension



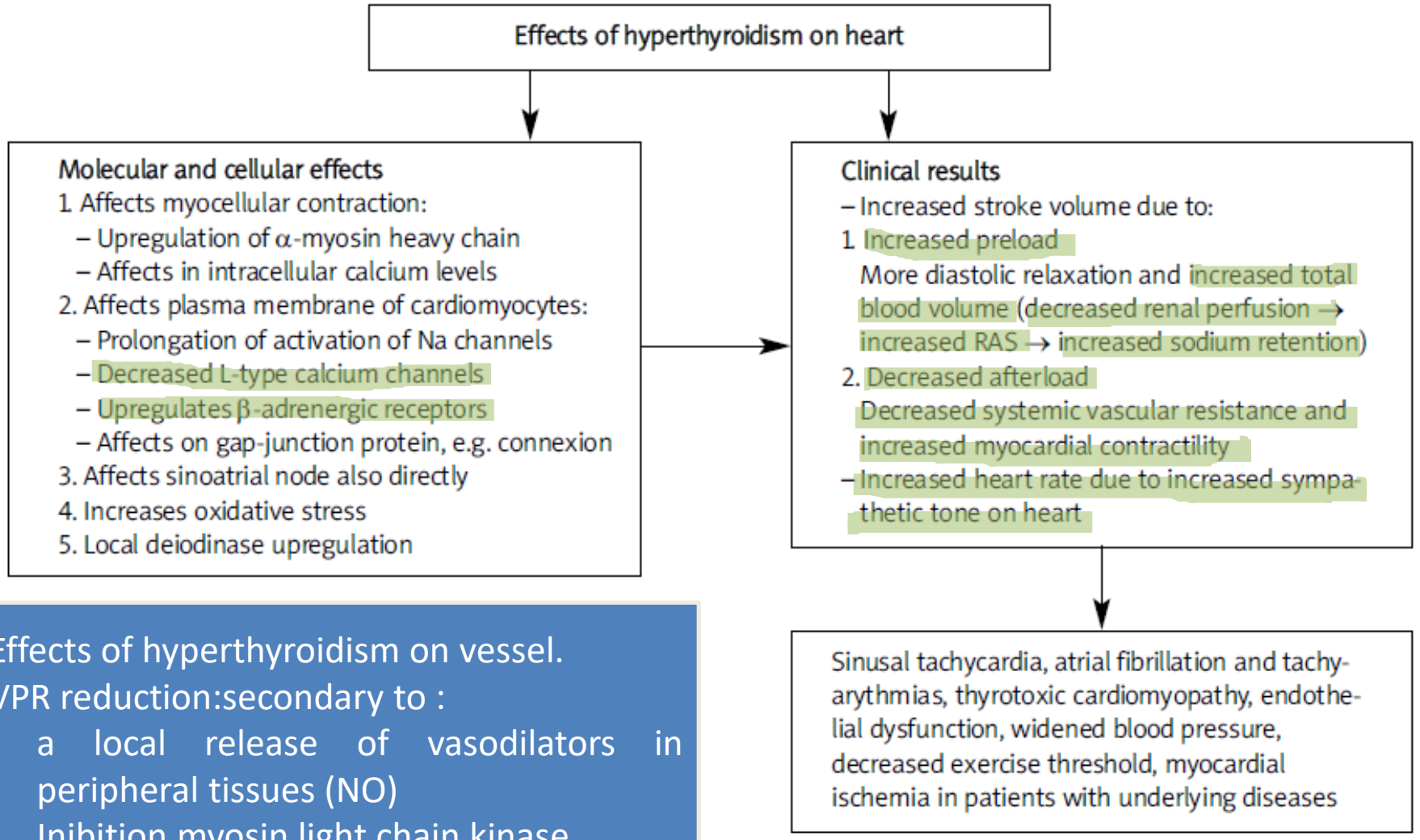
Wang, BioMed Research International 2017

Effects of thyroid hormones on cardiovascular system



Paschou, Endocrine (2022)

Summary pf molecular and clinical effects of hyperthyroidism on cardiovascular system



Effects of hyperthyroidism on vessel.
VPR reduction:secondary to :

- a local release of vasodilators in peripheral tissues (NO)
- Inibition myosin light chain kinase

Barreto Curr Opin Endocrinol Diabetes Obes 2011

Arch Med Sci 5, October / 2013

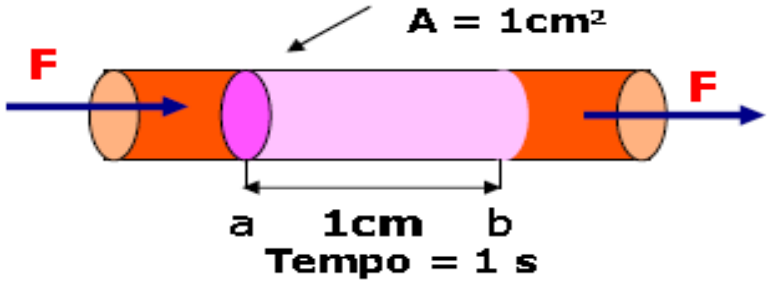
Fattori determinanti la Pressione arteriosa

P = F (Gc = precarico x a.c.) x R ($8\eta L / \pi r^4$)

1 - volume ematico
2 - attività cardiaca
3 - viscosità ematica (η)
4 - raggio medio arteriolare (r)

Attività di pompa del cuore

IPERTENSIONE SISTOLICA ISOLATA



$V = F/A$

$F = V \cdot A$

$F = (1\ cm/sec) \cdot 1\ cm^2 = 1\ cm^3/sec$

Hyperthyroidism and CV risk factors

Table 1 Total population with health problems registered in the BDCAP database in 2019 and its distribution in patients with hyperthyroidism according to age, gender and cardiovascular risk factors.

	Total population in BDCAP	Patients with hyperthyroidism	
		Number	Percentage
All	38,365,258	384,182	1.00
Gender			
Male	18,230,737	83,939	0.46
Female	20,134,521	300,243	1.49
Age (years)			
0–14	5,598,051	2,327	0.04
15–34	7,591,284	32,664	0.43
35–64	17,119,977	208,110	1.21
65 and over	8,055,946	141,080	1.75
Cardiovascular risk factors			
Hypertension	7,690,491	134,090	1.74
Dyslipidemia	8,326,527	132,420	1.59
Diabetes	3,133,467	49,486	1.57
Smoking	2,931,070	41,832	1.42

Iglesias, Endocrinología, Diabetes y Nutrición 70 (2023)

Hyperthyroidism and CV risk factors

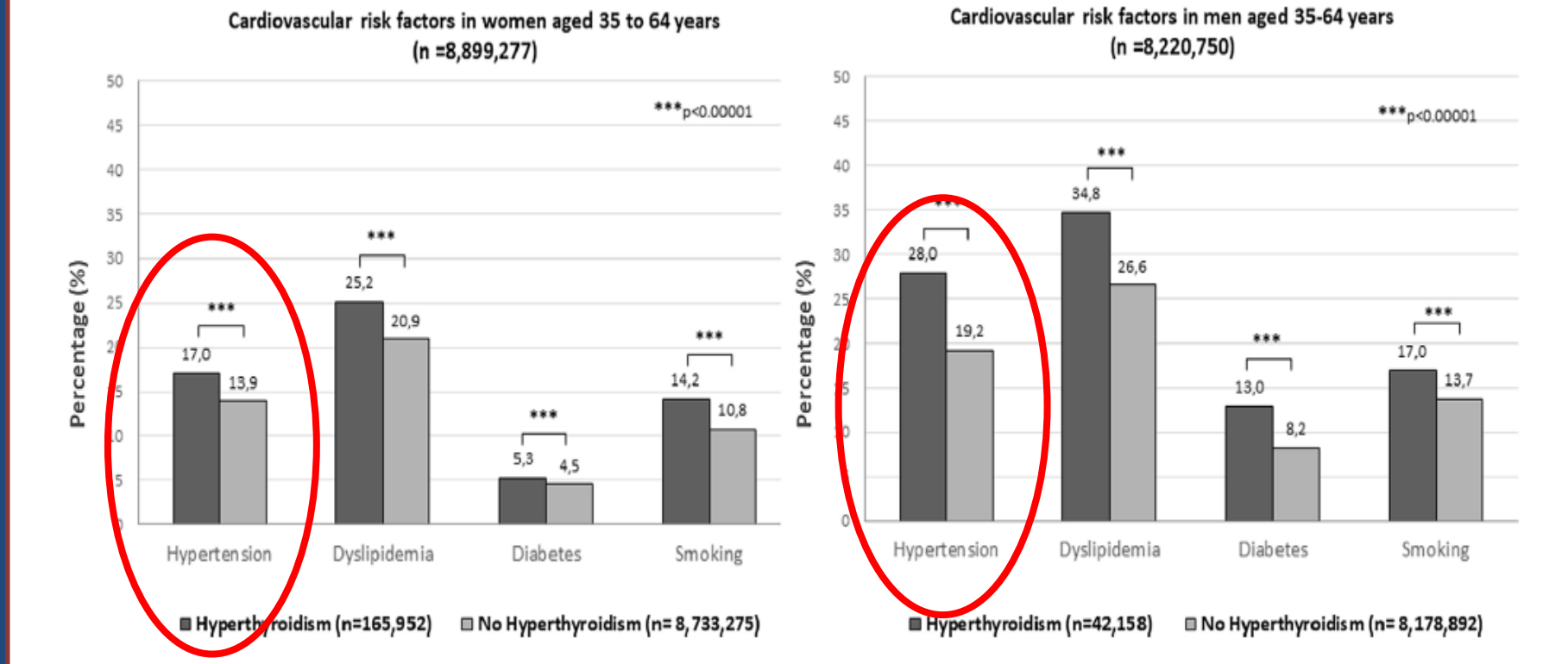


Figure 1 Cardiovascular risk factors in women (left) and men (right) aged 35–64 years according to the presence or absence of hyperthyroidism.

Iglesias, Endocrinología, Diabetes y Nutrición 70 (2023)

Increased long-term cardiovascular morbidity among patients treated with radioactive iodine for hyperthyroidism

Saara Metso*†, Anssi Auvinen‡§, Jorma Salmi*, Heini Huhtala‡¶ and Pia Jaatinen*†

Clinical Endocrinology (2008) **68**, 450–457

Table 2. Hospitalization rate caused by different cardiovascular diseases per 10 000 person-years in the hyperthyroid patients and the age- and sex-matched control group

	Patients			Controls			
Cardiovascular disease	Cases	Person-years	Hospitalization rate	Cases	Person-years	Hospitalization rate	Patients *vs.* controls Rate ratio (95% CI)
Arrhythmias	643	24 864	258·6	397	27 218	145·9	1·22 (1·07–1·39)*
Coronary artery	538	25 785	208·7	507	26 840	188·9	1·05 (0·93–1·19)
Cerebrovascular	428	26 725	160·2	344	28 015	122·8	1·31 (1·14–1·51)*
Other arteries and veins	357	25 917	137·7	296	27 219	108·7	1·22 (1·05–1·43)*
Hypertension	344	26 276	130·9	271	27 716	97·8	1·20 (1·02–1·41)*
Heart failure	346	27 141	127·5	214	28 650	74·7	1·48 (1·24–1·76)*
Pulmonary artery	86	27 821	30·9	61	28 969	21·1	1·36 (0·98–1·89)
Other†	54	27 947	19·3	47	29 064	16·3	1·16 (0·78–1·71)

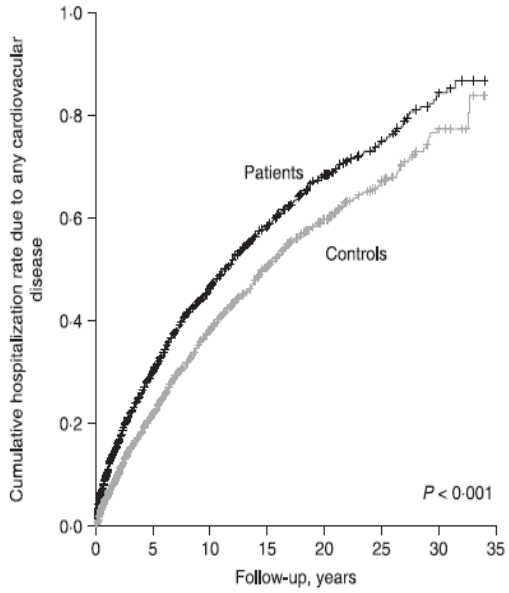
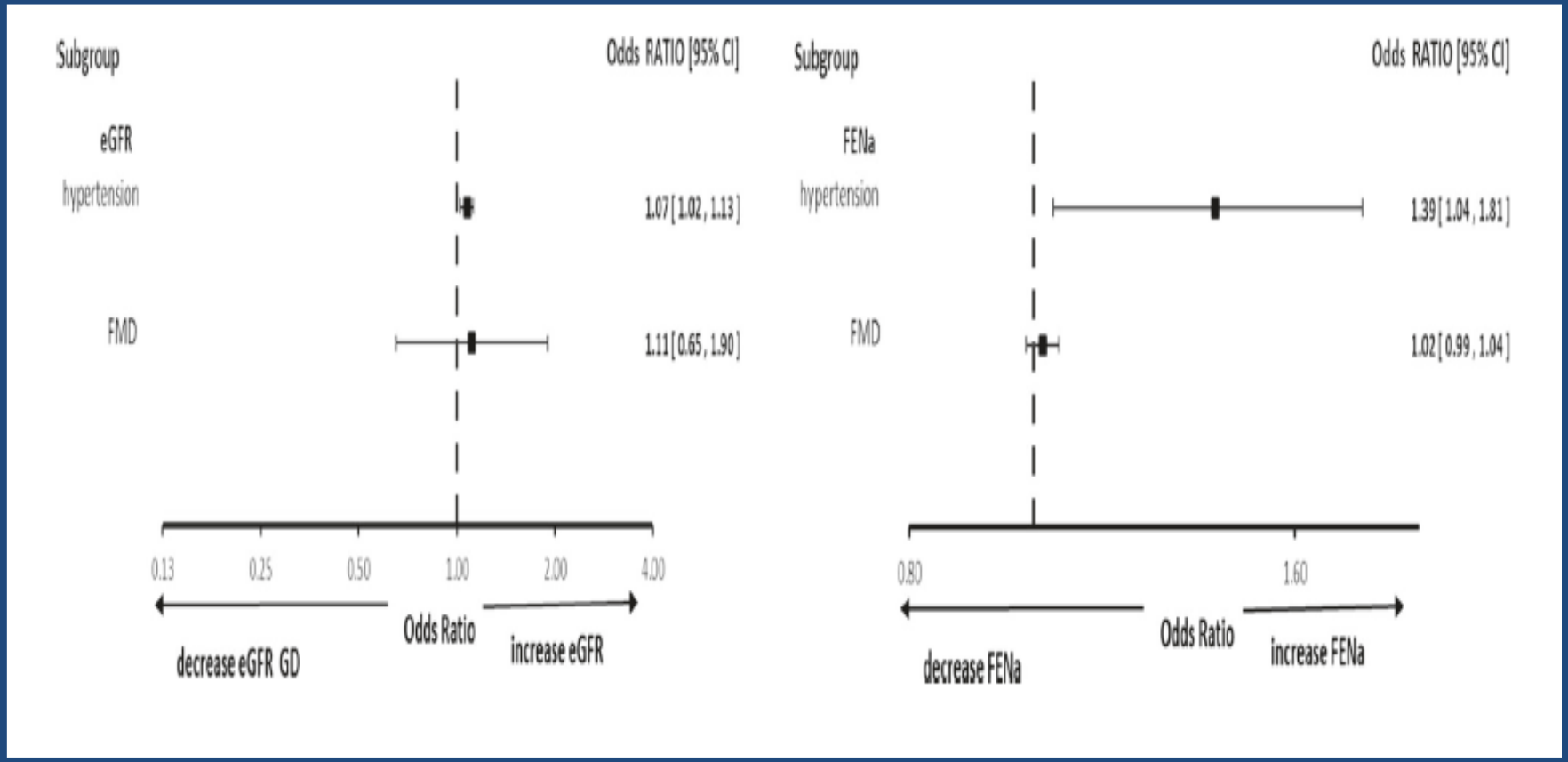


Fig. 1 Cumulative hospitalization rate due to cardiovascular disease (CVD) by time since treatment in the hyperthyroid patients treated with RAI compared with the age- and sex-matched control group ($P < 0{\cdot}001$, log rank test).

Renal function changes in patients with subclinical hyperthyroidism



Allam, Endocrine (2023)

The Incidence and Prevalence of Thyroid Dysfunction in Europe: A Meta-Analysis

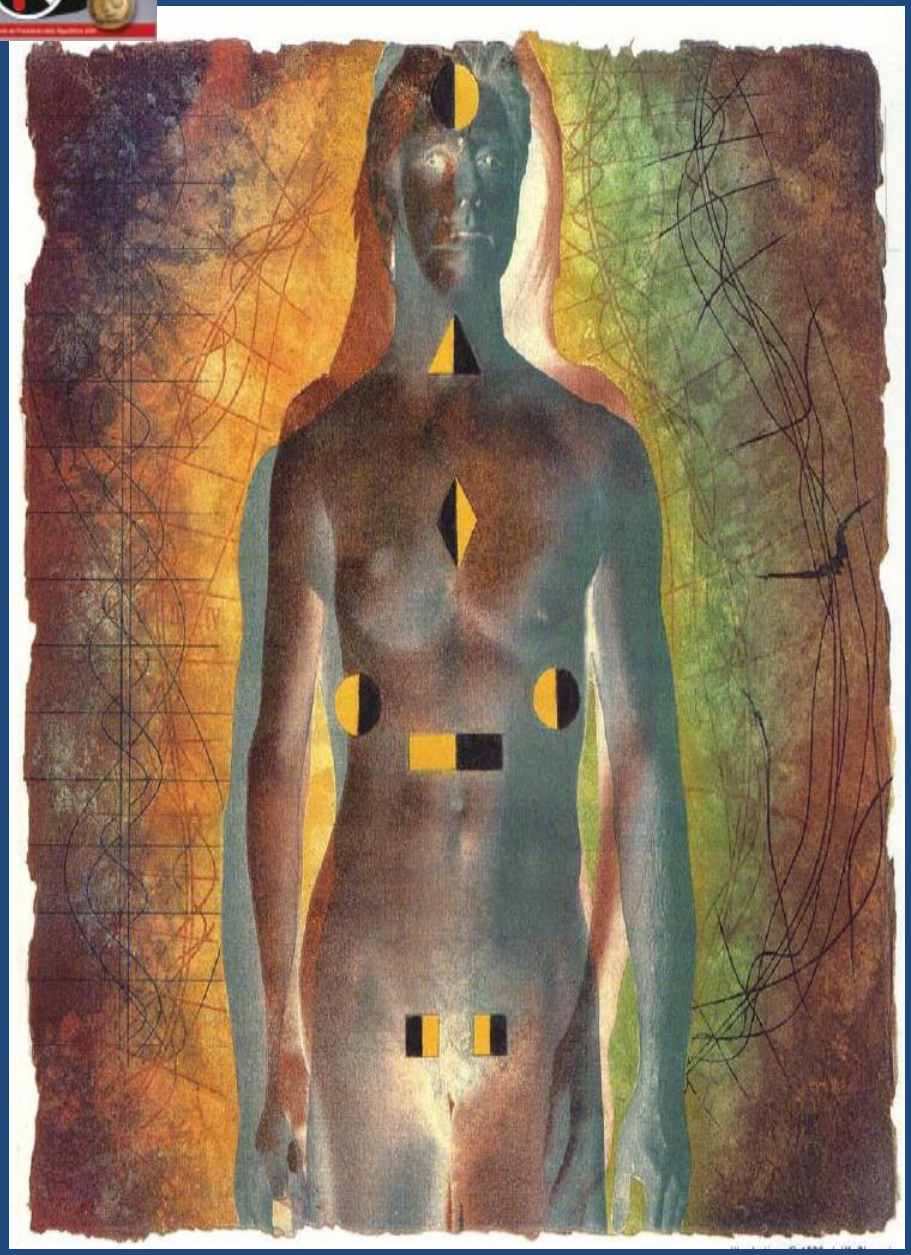
Table 1. Category 1: Undiagnosed Thyroid Dysfunction Prevalence

Study	Year	n	Age Range, y	Tests	Hypothyroidism, %			Hyperthyroidism, %		
					Total	SC	Overt	Total	SC	Overt
Tunbridge et al (13)	1977	2779 (54% F)	>18	TSH, FT_4, FT_3, TPOAb, TgAb	0.18 (100% F)			0.25 (71% F)		
Vanderpump et al (14)	1995	1877 (56% F)	38–93	TSH, FT_4	4.84 (89% F)			1.06 (95% F)		
Knudsen et al (15)	1999	2613	41–71	TSH, FT-	1 (81% F)	0.7 (83% F)	0.3 (75% F)	2 (71% F)	1.4 (57% F)	0.6 (100% F)
										0.34 (91% F)
										0.4
										5.65 (51% F)
										0.18 (50% F)
										0.35
										0.29–0.41
										6.86
										.076
										3

antibody;

- AACE: 13 M people (4.78%) in USA have undiagnosed thyroid dysfunction
- NHANES III screened 13344 people with previously unrecognized thyroid disease: 4.6% had hypothyroidism(0.3% overt and 4.3% subclinical) and 1.3% had hyperthyroidism (0.5% overt and 0.7% subclinical)
- In a Eu meta-analysis (17 studies) prevalence of undiagnosed thyroid dysfunction in Europe was 6.71%: 4.94% for undiagnosed hypothyroidism and 1.72% for undiagnosed hyperthyroidism.

J Clin Endocrinol Metab, March 2014



SINTOMI	FREQUENZA%
ERETISMO, INSONNIA	80 – 90
IPERIDROSI	50 – 91
INOLLERANZA AL CALDO	41 – 89
CARDIOPALMO	63 – 89
ASTENIA E FATICABILITA’	44 – 88
PERDITA DI PESO	52 – 85
AUMENTO DELLA’PPETITO	11 – 65
DIARREA	12 – 33
SEGNI	
GOZZO DIFFUSO	37 – 100
OFTALMOPATIA	49 – 62
RETRAZIONE PALPEBRE	38
LAGOFTALMO	48 – 62
TREMORI	40 – 97
MANI CALDE	72
MANI UMIDE	76
TACHICARDIA (> 90/MIN)	58 – 100
FIBRILLAZIONE ATRIALE	10 – 38

Clinical Medicine & Research
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stem

9146 hypertensive patients

ening for Thyroid Disorders Among Resistant Hypertension Patients: Are We Doing Enough?

ppan, MD; Mian Tanveer Ud Din, MD; Divya Venkat,
Patrick Wedgeworth, MD; and Sheng Fu, MD

1125 resistent hypertension

Ob quality assurance study assessing if hypo ar
appr atients with resistant hypertension.

Design: ected from ents sista ypertension, g on four or more different classes of ions. These patients were filtered to determine if thyroid stimulating hormo ccurred within 90 days of the addition of a fourth medication class.

Setting: Two internal medicine reside A.

Participants: Patients were selected w f hypertension and were seen in clinic between January 1, 2018 and December 23,

Methods: A single center retrospective review was perfo ed.

Results: A total of 1,125 patients were identified as having r tant hy patients were found to have a TSH measurement taken within 9 y class prescribed. Seven TSH values were found to be abnormal with c hyperthyroidism, demonstrating a screening rate of 6.6%. There were s in age, body mass index, and diastolic blood pressure in those screene

Conclusions: Thyroid disease is under-screened as an etiology for resista given the ease of diagnosis and reversibility of these conditions.

Keywords: Thyroid dysfunction; Resistant hypertension; Thyroid screening; Primary care

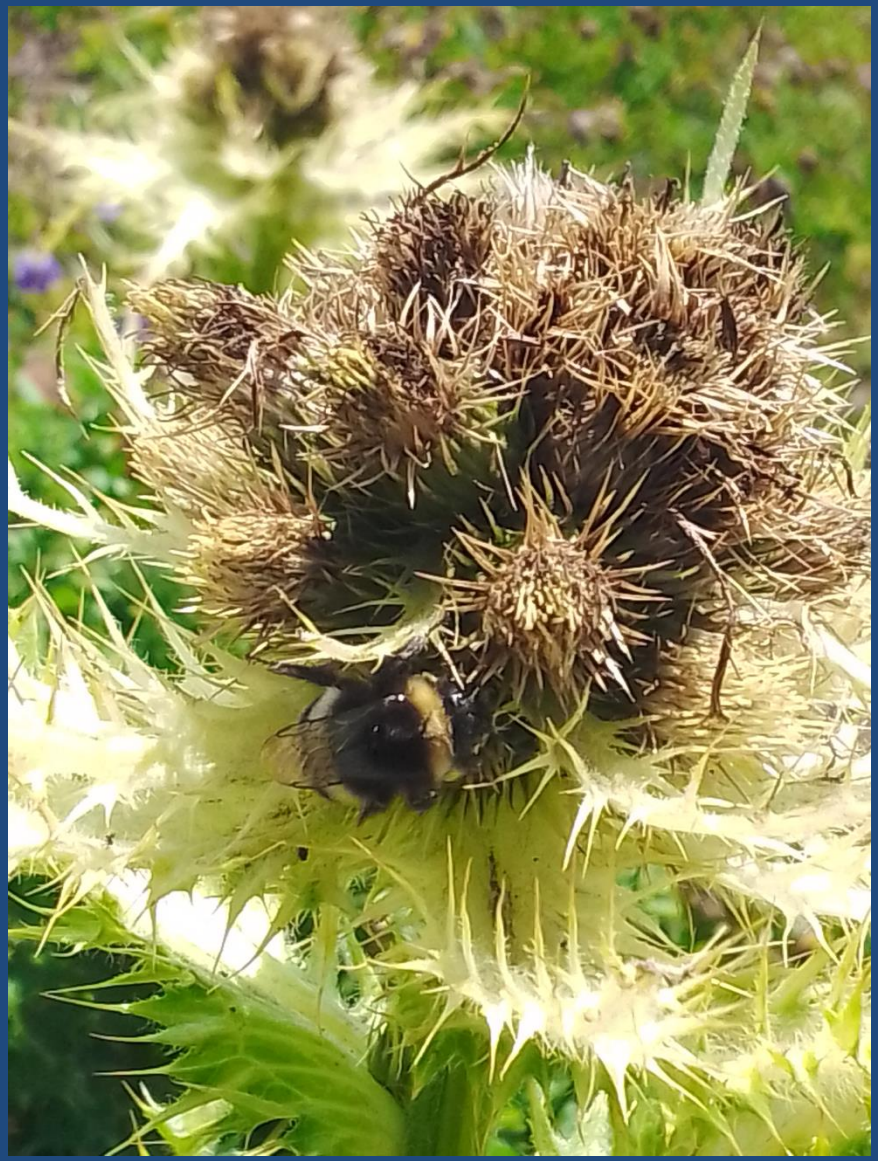
6/74 screened due to HT

74 TSH (6,6%)

7 abnormal TSH
1 HTR
6 subclinical dis

Take home messages

- According to a meta-analysis, nearly 11% of Europeans have thyroid dysfunction and only about half of them are aware of their condition.
- Hyperthyroidism is identified as cause of HT in < 1%, but the frequency of HT in thyreotoxicosis is estimated at 20- 68% .
- Even middle changes in thyroid hormones levels increase cardiovascular mortality from 20% to 80%.
- Thyroid disorders have serious effects on the CV system via plenty mechanisms, including dyslipidemia, hypertension, systolic and diastolic myocardial dysfunction, as well endothelial dysfunction.
- Thyroid disease is under-screened as an etiology for resistant hypertension, particularly given the ease of diagnosis and reversibility of these conditions
- Screening TSH level is costeffective
- Treatment of hyperthyroidism results in an average decrease SBP 5 mmHg.
- Early diagnosis would prevent the development of complications and cardiovascular diseases



La natura delle cose ama celarsi

Eraclito

Grazie per l'attenzione