

Influence of hypothyroidism on the postoperative course in elderly patients undergoing cardiac surgery

Wpływ niedoczynności tarczycy na przebieg pooperacyjny u starszych chorych poddanych operacjom kardiochirurgicznym

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Abstract

Background: Thyroid hormones are necessary for normal functioning of the organism. Undiagnosed hypothyroidism in elderly patients may lead to a number of life-threatening complications in the postoperative period.

Aim: The aim of the study was to establish whether a complicated postoperative course in elderly patients is related to hypothyroidism.

Material and methods: The data of 312 patients ≥ 65 years of age who underwent cardiac surgery between 01.01.10 and 31.07.10 with euthyroidism documented before the surgery were analysed. Two groups were selected: group I – patients with postoperative euthyroidism ($n = 295$), and group II – patients with postoperative hypothyroidism ($n = 17$).

Results: Postoperative complications occurred significantly more often in the group of elderly patients with hypothyroidism in the postoperative period. The most frequently observed complications were pleural effusion ($n = 7$, 41.2%, $p < 0.001$), delirium ($n = 6$, 23.5%, $p = 0.04$), prolonged respiratory therapy ($n = 5$, 29.4%, $p = 0.041$) and cardiac tamponade ($n = 4$, 23.5%, $p < 0.001$).

Conclusions: Postoperative hypothyroidism increases the risk of postoperative complications in elderly patients. All patients ≥ 65 years of age should undergo an assessment of the thyroid hormonal function before and after cardiac surgery.

Key words: elderly patients, hypothyroidism, perioperative complications

Streszczenie

Wstęp: Hormony tarczycy są niezbędne do prawidłowego funkcjonowania całego organizmu. Nierozpoznana w okresie pooperacyjnym niedoczynność tego narządu u starszych chorych może doprowadzić do wielu groźnych dla życia powikłań.

Cel: Celem pracy było ustalenie, czy na powikłany przebieg pooperacyjny u starszych chorych miała wpływ niedoczynność tarczycy, będąca skutkiem stresu okołoperacyjnego.

Materiał i metody: Przeanalizowano przypadki 312 pacjentów mających 65 i więcej lat, leczonych kardiochirurgicznie od 1 stycznia do 31 grudnia 2010 roku i będących w eutyreozy przed operacją. Pacjentów podzielono na dwie grupy: grupę I stanowiły osoby z pooperacyjną eutyrozą ($n = 295$), a grupę II – chorzy z pooperacyjną hipotyrozą ($n = 17$).

Wyniki: Powikłania po leczeniu kardiochirurgicznym znacznie statystycznie częściej występowały u starszych chorych będących w pooperacyjnej hipotyreozy. Do najczęściej obserwowanych powikłań zaliczono: płyn w jamach opłucnowych ($n = 7$, 41,2%, $p < 0,001$), delirium ($n = 6$, 23,5%, $p = 0,04$), przedłużoną respiratoroterapię ($n = 5$, 29,4%, $p = 0,041$) oraz tamponadę serca ($n = 4$, 23,5%, $p < 0,001$).

Wnioski: Pooperacyjna niedoczynność tarczycy w istotny sposób zwiększa ryzyko wystąpienia powikłań pooperacyjnych u starszych pacjentów. U wszystkich chorych ≥ 65 lat należy wykonać panel badań tyreologicznych zarówno przed operacją kardiochirurgiczną, jak i po niej.

Słowa kluczowe: starsi chorzy, niedoczynność tarczycy, powikłania okołoperacyjne

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Background

An accurate diagnosis of hypothyroidism in elderly people may be challenging. Due to nonspecific symptoms it is usually performed at an advanced stage of the disease. The most frequent symptoms include persistent feeling of cold, dry skin/desquamation of skin, urine incontinence, worsening of anginal pain, changes in blood pressure, and constipation. The most frequent findings on physical examination are thick and pale skin, subcutaneous deposits of mucopolysaccharides, oedema of the eyebrows, cardiomegaly, and pleural and pericardial effusion. Laboratory findings consist of hyperlipidaemia, anaemia and hyponatraemia. In the elderly patient the symptoms of hypothyroidism may be masked by symptoms of other commonly present diseases such as bradycardia or ventricular arrhythmia in the course of coronary artery disease, respiratory failure, chronic obstructive pulmonary disease on steroid therapy with forced expiratory volume in 1 s (FEV₁) < 60% of the reference values, previous stroke, dementia, diabetes or renal failure with glomerular filtration rate (GFR) < 60 ml/min [1-3].

Aim

The aim of the study was to assess whether a complicated postoperative course in elderly patients may be influenced by stress-related hypothyroidism.

Material and methods

The study included 312 patients ≥ 65 years of age who underwent cardiac surgery between 01.01.10 and 31.12.10 with euthyroidism documented before the surgery. Patients were divided into two groups. Group I included those with postoperative hypothyroidism (*n* = 295) and group II consisted of patients with postoperative hypothyroidism (*n* = 17). A panel of thyroid tests (TSH, fT3, fT4) was performed in all patients ≥ 65 years of age before the surgery and on day 5 after the surgery. Hormonal profile was assessed in the Drug Monitoring Laboratory of the Silesian Center for Heart Diseases by means of a non-isotopic immuno chemiluminescent method (CHLIA) which is characterized by high sensitivity (0.02 mIU/l and lower). Currently valid reference ranges were used: for thyroid-stimulating hormone (TSH) 0.47-4.64 mIU/l, for triiodothyronine (fT3) 1.45-3.48 pg/ml and for tetraiodothyronine (fT4) 0.45-1.37 ng/ml. The analysed geriatric patients suffered from many comorbidities which in both groups included mainly diabetes, chronic renal failure and peripheral atherosclerosis. Demographic and clinical characteristics of both studied groups are presented in Tables 1-2.

Results

One of the leading complications which occurred in the elderly patients after cardiac surgery, both in euthyroidism and hypothyroidism in the postoperative period, was a cog-

nitive disorder in the form of delirium (8.3% vs. 23.5%; *p* < 0.001 vs. *p* = 0.04).

Respiratory therapy prolonged > 24 h was required in 29.4% (*p* = 0.041) of the elderly patients with diagnosed postoperative hypothyroidism, which led to a worse prognosis and ended with death in 11.7% of cases.

One fifth of the elderly patients with hypothyroidism in the postoperative period had a tendency towards accumulation of pericardial effusion. Acute cardiac tamponade requiring surgical decompression was noted in 4 patients (23.5%, *p* < 0.001).

Perioperative myocardial infarction occurred sporadically (1.4%, *p* = 0.949 vs. 7.0%, *p* = 0.525) and was insignificantly more frequent in the group of elderly patients with postoperative hypothyroidism. In 40% of the elderly patients with postoperative hypothyroidism pleural effusion required mechanical decompression (*p* < 0.001).

In contrast, the occurrence of pericardial effusion was very rare in operated patients with postoperative euthyroidism (3.5% vs. 3.9%, *p* = 0.705). The results are presented in Table 3.

Discussion

Currently used methods of thyroid hormone profiling such as the immuno chemiluminescence (CHLIA) used in our centre are characterized by very high sensitivity (< 0.02 mIU/l) and therefore allow detection not only of primary but also of secondary (postoperative) hypothyroidism [4].

The diagnosis of hypothyroidism in patients after surgery is challenging. Low level of TSH, but also fT3 and fT4, may be worrisome in the first days after the procedure.

Table 1. Demographic characteristics of the studied groups

Tabela 1. Charakterystyka demograficzna badanych grup

Parametres	Group I (<i>n</i> = 295)	Group II (<i>n</i> = 17)	Value of <i>p</i>
Hormones before surgery			
TSH [μIU/ml]	3.45 ± 0.37	3.29 ± 0.41	0.16
fT3 [pg/ml]	2.71 ± 0.28	3.12 ± 0.72	0.23
fT4 [ng/ml]	1.10 ± 0.04	1.23 ± 0.91	0.31
Hormones after surgery			
TSH [μIU/ml]	3.76 ± 0.43	12.31 ± 3.21	< 0.01
fT3 [pg/ml]	3.40 ± 0.56	1.39 ± 0.92	< 0.01
fT4 [ng/ml]	1.22 ± 0.28	0.40 ± 0.06	< 0.01
Sex			
Female	170	10	
Male	125	7	
Age [years]			
Female	71 ± 3.02	73 ± 4.06	0.22
Male	72 ± 4.09	74 ± 5.08	0.31
Male	69 ± 3.08	70 ± 3.03	0.12

Table 2. Clinical characteristics of the studied groups
Tabela 2. Charakterystyka kliniczna badanych grup

Parametres	Age category				Value of <i>p</i>
	Group I		Group II		
	≥ 65 – euthyroidism after surgery		≥ 65 – hypothyroidism after surgery		
	(<i>n</i> = 295)	94%	(<i>n</i> = 17)	6%	
	<i>n</i>	%	<i>n</i>	%	
Diabetes	65	22.00	6	30.00	< 0.001
Renal failure	40	13.5	4	18.6	< 0.001
COPD	23	7.5	2	8.6	0.350
Significant carotid artery stenosis	35	11.65	3	14.68	< 0.001
Peripheral arterial disease	148	11.70	3	14.61	0.041
Type of procedure					
	CABG	62	21.1	2	15.00
	OPCAB	86	29.2	8	44.10
	MIDCAB	13	4.40	0	0.00
	Valves	77	26.1	4	18.3
	Complex	15	5.3	3	22.6
	Aneurysm	1	3.4	0	0.00
	Transplantation	0	0.00	0	0.00
	Other	91	10.5	0	0.00

Table 3. Postoperative complications
Tabela 3. Powikłania pooperacyjne

Complication	Group I – postoperative euthyroidism (<i>n</i> = 295)	Group II – postoperative hypothyroidism (<i>n</i> = 17)	Value of <i>p</i>
IVPP > 24 h	20 (6.88%)	5 (29.4%)	0.018
Delirium	24 (8.3%)	6 (23.5%)	0.041
Tamponade	3 (1.04%)	4 (23.5%)	< 0.001
Pleural effusion	10 (3.58%)	3 (17.6%)	< 0.001
Death	5 (1.79%)	2 (11.7%)	NS

A few available scientific reports suggest that key factors expressing a suppressive effect on the excretion of TSH in patients in poor general condition include inflammatory factors such as cytokines, catecholamines (dopamine) and some hormones, for example steroids. Perioperative complications in the first hours after the surgery may lead to a decrease of TSH concentration to 0.02-0.3 µIU/ml [5-7].

During recovery after the surgery, TSH concentration may increase to 20 µIU/ml. Difficulties in differential diagnosis between low T3/T4 and secondary or tertiary hypothyroidism may be resolved by means of pituitary gland or hypothalamus imaging (magnetic resonance imaging – MRI, computed tomography – CT) or by measurement of other hormones secreted by the anterior lobe of the pituitary gland and rT3. The TSH concentration of 0.05-10 mIU/l in hospitalized patients does not necessarily need to indi-

cate a thyroid disease and therefore in this group of patients it is indicated not to assess TSH level or initiate therapy without a clear reason [8].

Observations from our centre based on a detailed analysis of each elderly patient suggest that a decision to initiate treatment with thyroid hormones is rational in patients presenting with symptoms of hypothyroidism. A decision to initiate hormonal therapy was made in each case of low fT3 concentration regardless of TSH level in an elderly patient who was in euthyroidism before the surgery and demonstrated normal psycho-physical activity, but suffered from delirium, depressed systolic heart function, effusion into the serous cavities and had a slow rehabilitation process. The importance of early detection and initiation of hormonal substitution in hypothyroidism was demonstrated by Rodondi *et al.*, who assessed the risk of congestive heart failure episodes, coronary incidents, stroke, peripheral arterial disease and mortality from any cause in 2730 patients (mean age: 74.7 years) without known cardiovascular disease, but with diagnosed postoperative subclinical hypothyroidism. The authors found an increased frequency of heart failure episodes in patients with TSH concentration ≥ 7 µIU/ml [8].

In the case of an elderly patient with postoperative hypothyroidism, successful ending of hospitalization on the cardiac surgery ward is not limited to initiation of hormonal substitution. Other important issues include specialized care by physicians and nurses, psychological reassurance, continuation of efficient rehabilitation at home with help from the family or, in the case of institutionalisation, from the patient's guardians.

Conclusions

Postoperative hypothyroidism increases the risk of post-operative complications in elderly patients. All patients ≥ 65 years of age should undergo an assessment of the thyroid hormonal function before and after cardiac surgery.

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