Intrathoracic goiter: analysis of 21 cases

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Intrathoracic goiter is classified into: the cervical, retrosternal, substernal and intrathoracic. The aim of research is to analysis of intrathoracic goiters (ITG) which include goiters with more than 80% of tissue in the thoracic cavity and intrathoracic thyroid choristomas. Methods: In prospective non-randomized study were analyzed 21 consecutive patients operated on for intrathoracic non-toxic benign goiters from 1987-98. Fourteen patients with intrathoracic goiters (more than 80% of tissue in the thoracic cavity) and seven patients with intrathoracic choristomas were operated. Two groups of ITG were observed according to the expressed symptomatology and surgical approach and complications of operative treatment were compared to the complications of operative treatment of 986 non-ITG non-toxic benign goiters. Results: ITG represented 1.1% of the whole number of operatively treated thyroid diseases. One third of patients were asymptomatic. Commonly observed symptoms were dysnea, stridor and dysphagia and there was no significant difference in appearance of these symptoms between the two groups of ITG. In 19% of patients correct preoperative diagnosis wasn’t assessed. Cervical approach with sternotomy was used in 11 patients, cervical approach with right thoracotomy in seven, right thoracotomy only in two, and cervical approach only in one patient. Thoracic approach was used in 95% of cases and there was no significant difference between the two groups of ITG. Concerning the operative complications, in two patients transient vocal cord paresis and in one patient postoperative bleeding were verified. There was no statistically significant deference in frequency of operative complications between ITG and non-ITG. Conclusions: ITG are rare, but might present a difficult diagnostic and complex surgical problem. Common clinical presentation and identical surgical approach in operative treatment justify the common review of the two groups of intrathoracic goiters. With adequate and timely performed surgical approach, in specialized institutions, frequency of complications in operative treatment of ITG is not higher if compared to operative treatment of non-ITG.

Key words: intrathoracic goiter, surgery, complications, intrathoracic thyroid choristoma, surgery.

The intrathoracic goiters represent embryonal disturbance in genesis and development of thyroid gland. They develop in the first few months of intrauterine life and make inferior group of median malpositions of thyroid gland.

A goiter placed, partly or on the whole, in the thoracic cavity, is usually referred to as intrathoracic goiter. However, insufficient definition of intrathoracic malpositions of thyroid gland causes usage of different classifications and, hence, some authors often even miss to cite criterions for goiters as they group them into the endo, mediastinal, retrosternal or substernal. Frequently, the same term for different goiters is applied or, adversely, different terms are used to describe the identical goiters.

We classify all the intrathoracic malpositions of thyroid gland into:
1. The retrosternal goiters (less than 50% of thyroid tissue in the thoracic cavity) (Fig. 1),
2. The substernal goiters (50%-80% of thyroid tissue in the thoracic cavity) (Fig. 2),
3. The intrathoracic goiters (more than 80% of thyroid tissue in the thoracic cavity) (Fig. 3 and 4). In this group we include the intrathoracic thyroid choristomas (completely separated thyroid tissue in the thoracic cavity, with or without thyroid tissue in normal position).

The aim of this research is to review our experiences in treatment of intrathoracic goiters, to present the classification system for the goiters with intrathoracic malpositions
and to point out the diagnostic problems and surgical dilemmas. Our first hypothesis is: a joint review of these two groups of intrathoracic goiters, due to the common surgical application, is justified. Our second hypothesis is: providing correctly chosen, timely performed and combined surgical approach, frequency of complications in operative treatment of intrathoracic goiters is not higher then in the operative treatment of cervical goiters.

PATIENTS AND METHODS

All surgically treated patients with intrathoracic goiters were prospectively analyzed since 1987 until 1998.

In patients with more than 80% of goiter’s tissue located in thoracic cavity, a collar (Kocher’s) incision was performed plus partial or total sternotomy or thoracotomy, when necessary. A thoracic approach was applied for the thyroid gland choriostomas with addition of a collar incision in order to treat the cervical thyroid gland, when necessary.

Distribution of these goiters according to the patient’s age and sex was analyzed, while the two groups of intrathoracic goiters according to the presented symptomatology, diagnostic possibilities, used surgical approach and difficulties in the performed operative procedures were compared.

The follow-up for all patients lasted two years to ensure an early detection of complications subsequent to operative treatment or recurrence. The results of observed complications were compared with results of 986 patients with cervical, benign, non-toxic thyroid goiters, surgically treated in the same period of time.

In statistical analysis of the collected data, besides basic statistical parameters, 2 and Student’s t test were used.

RESULTS

Twenty-one patients with intrathoracic goiters (9 men and 12 women) admitted to the Clinic for general and vascular surgery and to the Clinic for thoracic and cardiac surgery of the Military Medical Academy were treated between 1987 and 1998. All thyroid ectopies were evident in 1.4% patients; intrathoracic goiters in 1.1% patients operated for thyroid gland diseases 3. The average patient’s age was 49.8 years; the highest percentage of patients in the 6th and 7th decade of life.

In 14 cases the goiter was with more than 80% of tissue located in the thoracic cavity, while in 7 cases there was a completely separated mediastinal goiter (choristoma). One patient with proved intrathoracic papillary carcinoma and multiple compressive syndromes, who wasn’t operated, was not included in this series.

Clinical presentations of our patients remarkably varied (Table 1). One third of patients presented no symptoms. In symptomatic patients the dominant symptom was dyspnea (in 80% of cases). Difference in presentation of the most frequent symptoms (dyspnea, stridor, and dysphagia) wasn’t statistically significant between the two groups of intrathoracic goiters. Thoracic outlet syndrome, hoarseness and superior caval vein syndrome were noticed only in a group of patients with predominantly (80%) intrathoracic goiters. Hoarseness was evident in four pati-
TABLE 1
SYMPTOMS AND SYNDROMS PRESENT WITH INTRATHORACIC GOITERS

<table>
<thead>
<tr>
<th>Symptoms and syndromes</th>
<th>Intrathoracic goiters (n=14)</th>
<th>Intrathoracic choristomas (n=7)</th>
<th>Total (n=21)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No1</td>
<td>%</td>
<td>No2</td>
</tr>
<tr>
<td>Asymptomatic</td>
<td>4</td>
<td>28.6</td>
<td>3</td>
</tr>
<tr>
<td>Dyspnea*</td>
<td>8</td>
<td>57.1</td>
<td>4</td>
</tr>
<tr>
<td>Stridor*</td>
<td>4</td>
<td>28.5</td>
<td>1</td>
</tr>
<tr>
<td>Dysphagia*</td>
<td>4</td>
<td>28.6</td>
<td>1</td>
</tr>
<tr>
<td>Hoarseness</td>
<td>4</td>
<td>28.6</td>
<td>-</td>
</tr>
<tr>
<td>Thoracic outlet syndrome</td>
<td>1</td>
<td>7.1</td>
<td>-</td>
</tr>
<tr>
<td>Superior caval vein syndrome</td>
<td>1</td>
<td>7.1</td>
<td>-</td>
</tr>
</tbody>
</table>

*Student’s t test: p<0.05

TABLE 2
USED OPERATIVE APPROACH IN TREATMENT OF INTRATHORACIC GOITERS

<table>
<thead>
<tr>
<th>Operative approach</th>
<th>Intrathoracic goiter (80%) (n=14)</th>
<th>Intrathoracic choristoma (n=7)</th>
<th>Total (n=21)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No1</td>
<td>%</td>
<td>No2</td>
</tr>
<tr>
<td>Cervical approach</td>
<td>1</td>
<td>7.1</td>
<td>-</td>
</tr>
<tr>
<td>Cervical-sternotomy</td>
<td>9</td>
<td>64.3</td>
<td>2</td>
</tr>
<tr>
<td>Cervical-right thoracotomy</td>
<td>3</td>
<td>21.4</td>
<td>1</td>
</tr>
<tr>
<td>Right thoracotomy</td>
<td>-</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>Subsequent cervical approach</td>
<td>1</td>
<td>7.1</td>
<td>2</td>
</tr>
</tbody>
</table>

Student’s t test X test: p<0.05

Preoperative duration of symptoms was 5.1 years (1-15 years). Obesity (more than 20% from ideal weight) was recorded in 76.2% of patients. All patients were euthyroid and there was not a single patient with previous history of the thyroid gland surgery.

Regarding diagnostic procedures, general and specific laboratory analysis, chest X-ray film and ultrasound of the cervical gland were done for every patient, thyroid gland scintigraphy (Fig. 5) and CT examination of the neck and chest were performed in 17 patients, biopsy of the gland was performed in 15 patients (in 13 fine needle biopsy of cervical gland, in one patient fine needle biopsy of intrathoracic mass and large needle biopsy of the cervical gland in one patient). MRI was performed in eight patients, esophagogastroscopey and esophagography (Fig. 6) in seven patients, lung scintigraphy (Fig. 7) in six patients, selective angiography in five, phlebography (Fig. 8) in four and mediastinoscopy in four patients. Pre-operative diagnosis wasn’t correct in four (19%) patients (in three with choristomas).

The approaches employed in operations were: Kocher’s cervical incision in 11 patients, cervical incision with right thoracotomy in four patients and the right thoracotomy solely, in two patients (Table 2). Three patients underwent surgery due to diagnosis of mediastinal tumors. In these cases only intra-operative finding and pathohistological ("ex tempore") examination revealed the intrathoracic goiter, so, these patients underwent second operation later (Table 2 and 3). Referring to a demand for the combined operative approach (cervical + thoracic) there was no statistically significant difference between the two groups of intrathoracic goiters (Table 2).

In 14 cases, with mostly (80% of tissue) intrathoracic goiters (Fig. 9), the goiters were equally located in the anterior and the posterior mediastinum and in four patients (28.6%) cervical gland was unnoticeable. In seven cases of the completely separated intrathoracic goiters (Fig. 10), low pretracheal position of the goiter in the anterior mediastinum was found in three patients, in four cases the goiter was located in the posterior mediastinum and in three patients (42.9%) the cervical gland was unnoticeable (in one patient cervical gland was completely absent). Intrathoracic goiter was connected to the left lobe of the cervical thyroid gland in 11 patients, to the right lobe in five, to the both lobes in two patients and with three patients such connection wasn’t identified.

The used operative procedures are shown on the Table 3. Diameter of extirpated choristomas was 11.6 cm (5-21 cm).

The pathohistological examination in all patients confirmed diagnosis of benign, adenomatous and colloid goiter.

Of complications following operative treatment we had a unilateral lesion of the laryngeal reccurens in two cases and one large mediastinal hematome which demanded reoperation. Paresis of the vocal cord in one patient appeared early in the postoperative course; in another, paresis emerged one month after the operation. In both cases the vocal cords recovered completely after two months of physical therapy. Other complications including hypocalcemia or death, or some late complications (recurrence, hypoparathyroidism), were not recorded at all. There was not statistically significant difference in frequency of operative complications between groups of patients with intrathoracic and cervical goiters (Table 4).
DISCUSSION

Definition. Since 1883 and the first Wolff's classification until our time, the insufficient definition of intrathoracic thyroid gland malpositions has provoked formulations of many different classifications. However, none of them was widely accepted. Because of its simplicity, the prevalent classification used today is Lahey's (Table 5). Among many terms, ectopy of the thyroid gland, autonomous or aberrant goiter, are the most frequently used expressions for either goiter partly located in the thoracic cavity or completely separated tissues of the thyroid gland. We think that choriostoma is the right expression for completely separated tissues of the thyroid gland - "(ab)normal tissue in abnormal position".

The basic shortcomings of the classifications mentioned above, are insufficient definition and incompleteness. This produces different and, often, unclear criteria for grouping intrathoracic thyroid malpositions and, consequently, very different results and difficulties in any attempt for parallel review or analysis.

All the variations and anomalies of thyroid gland we classify into: 1) the malpositions of thyroid gland (thyroid gland partly or completely in malposition, for example: intrathoracic), and 2) the choriostomas or real ectopies (choriostoma syn. choriostoblastoma, atis, in greece: choristos=separate + blastos=germ + oma=tumor; tumor developed on a basis of separate "hearth").

We accept most of already existing classifications of intrathoracic thyroid malpositions but we made an effort in attempt to complete, modify and terminologically change them according to standard reviews in the literature. We classify all goiters with more than 80% of tissue located in the thoracic cavity and intrathoracic thyroid choriostomas (with or without gland in normal position, with or without vascular or fibrous connection between them) into the intrathoracic malpositions (Table 5). Intrathoracic goiters defined in this way are frequently reviewed together.

The occurrence of intrathoracic goiters is low and represents very rare clinical entity. Ours and experience of some relevant institutions in the world confirm that frequency of intrathoracic goiters occurrence is 0.1%-2% out of total number of thyroid gland surgical procedures.

However, the incorrect classification of intrathoracic goiters produced records in medical periodicals of the series of more than few hundred thyroidectomies in treatment of intrathoracic goiters, although these cases actually referred to the goiters with their lesser part intrathoracally located. Reported frequencies of 3%-20% of intrathoracic goiters from total number of patients who underwent surgery because of thyroid diseases are result of absence of standard criterions in classification. The inclusion of substernal goiters increases the frequency to 5%-9, and if we take into a consideration the retrosternal goiters too, the percentage reaches 15%-21. In five large series of almost 9000 thyroidectomies, incidence of intrathoracic goiters was 1.7%-13.5%. In one collected series of 6720 operations of thyroid gland in Germany, retrosternal goiters were represented with 5%-15%, intra-

![Figure 4](image4.png)

**FIGURE 4**
CT: INTRATHORACIC GOITER (MORE THAN 80% OF TISSUE IN THE THORACIC CAVITY) WITH CALCIFICATIONS

![Figure 5](image5.png)

**FIGURE 5**
INTRATHORACIC GOITER SCINTIGRAPHY WITH **79m** Te: ASYMETRIC, INHOMOGONOUS, MOSTLY THE RETROSTERNAL DISTRIBUTION OF RADIOPHARMAC

![Figure 6](image6.png)

**FIGURE 6**
OESOPHAGOGRAPHY: COMPRESSED AND DISLOCATED OESOPHAGUS INTO THE RIGHT (b) WITH VARIICES IN THE UP- PER HALF (a)
Intrathoracic goiter: analysis of 21 cases

Table 3

<table>
<thead>
<tr>
<th>OPERATIVE PROCEDURE</th>
<th>Intra-thoracic goiters (&gt;80%)</th>
<th>Intra-thoracic choristomas</th>
<th>Total (n=21)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(n₁=14)</td>
<td>(n₂=7)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>%</td>
<td>No</td>
</tr>
<tr>
<td>Total thiodectomy</td>
<td>5</td>
<td>35.7</td>
<td>-</td>
</tr>
<tr>
<td>Total lobectomy</td>
<td>3</td>
<td>21.4</td>
<td>1</td>
</tr>
<tr>
<td>Total subtotal lobectomy</td>
<td>2+1*</td>
<td>21.4</td>
<td>-1+1*</td>
</tr>
<tr>
<td>Bilateral subtotal lobectomy</td>
<td>3</td>
<td>21.4</td>
<td>-1+1*</td>
</tr>
<tr>
<td>Removing of choristoma only</td>
<td>-</td>
<td>-</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 4

<table>
<thead>
<tr>
<th>COMPLICATIONS</th>
<th>Cervical benign non-toxic goiters n=986</th>
<th>Intra-thoracic goiters n=21</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypocalcemia</td>
<td>2.5</td>
<td>0</td>
</tr>
<tr>
<td>Permanent hypoparathyroidism</td>
<td>0.9*</td>
<td>0</td>
</tr>
<tr>
<td>Vocal cord paralysis</td>
<td>7.0</td>
<td>9.5</td>
</tr>
<tr>
<td>Permanent vocal cord paralysis</td>
<td>2,1*</td>
<td>0</td>
</tr>
<tr>
<td>Prolonged intubation</td>
<td>0.5</td>
<td>0</td>
</tr>
<tr>
<td>Tracheostomy</td>
<td>0.3</td>
<td>0</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>0.3</td>
<td>0</td>
</tr>
<tr>
<td>Osopahgial lesions</td>
<td>0.1</td>
<td>0</td>
</tr>
<tr>
<td>Bleeding</td>
<td>0.6</td>
<td>4.8</td>
</tr>
<tr>
<td>Wound infection</td>
<td>0.2</td>
<td>0</td>
</tr>
<tr>
<td>Mortality</td>
<td>0.3</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>11.8+</td>
<td>14.3+</td>
</tr>
</tbody>
</table>

(Prevalence of complication included in previous) *Student's t test: p > 0.05

Intrathoracic goiters (100%) with 0.7% and choristomas with 0.2%-4%. In another collected series counting 23831 patients with thyroid gland operations, intrathoracic goiters were present in 0.1%-0.9%.

On the other hand, only 0.2%-15% of mediastinal masses represent the intrathoracic thyroid choristomas. However, based on the rich experiences of some specialized institutions, their frequency might be estimated between 1%-7%-25,31,32. The higher percentage (even in 35%) of mediastinal masses presented as intrathoracic choristomas and goiters could be only explained by special interest some institutions had for particular pathology.

In order to explain the higher frequency of intrathoracic goiters, geographic, endemic, demographic and constitutional features have been discussed. According to experience of majority of authors, these goiters are more frequently found in women (in 75%-85%) but ours and results of some other authors didn't reveal a statistically significant difference in sex distribution. However, these findings underline the difference related to the higher percentage of cervical goiters occurrence in women, which is almost 90%-13. Furthermore, we didn't confirm the results of some authors saying that intrathoracic goiters are found more frequently in significantly older patients in comparison to cervical thyroid diseases. Obesity is, on the other side, confirmed as significantly important factor.

Knowledge of embryology of the thyroid gland is essential for correct understanding of its anatomical variations and malpositions. Crucial moment of intrathoracic goiter development is the 6th week of intrauterine life when traechea starts developing from the second bronchial arch. Definitive position of thyroid gland is established with tracheal development and ventral migration of the thyroid bud and it is mostly influenced by the development of the heart's blood vessels. Namely, every bronchial arch has one blood vessel which later participates in formation of the large blood vessels of heart (III-V bronchial arch). With one band the endodermal cells of the future thyroid gland are connected to the aortic arch which descends into the thoracic cavity pulling all (or part of) cells along. Normal secretion and action of TSH are indispensable for thyroid gland migration to normal position, for its growing and function15. There are strong evidences that mutation of the TSH-receptor gene with autosomal recessive inheritance significantly influences the development of thyroid ectopies and that mother's antithyroidal immunoglobulines participate in prevention of the normal descent of thyroid gland and its later hypofunction15,30. Although the thyreoglossal band does not exist in almost 60% of people, some authors consider that its premature disruption makes maintenance of thyroid gland in normal position impossible. "Embryological theory" explains appearance of all malpositions of thyroid gland on its path of descent from the base of the tongue to the thoracic cavity and can also explain development of both groups of intrathoracic thyroid malpositions. Other thyroid ectopies should be considered as teratomas (like 'struma ovarii') or distant choristomas. Probably, many genetics, immunologies or other factors and their common influence cause the appearance of thyroid malpositions and ectopies.

Symptomatologies of intrathoracic goiters are very different, from totally asymptomatic clinical pictures to the serious symptoms of compression and sudden deaths caused by goiters. Patients can perform without any symptoms for many years or could be treated for cardiac or asthmatic diseases. According to literature, duration of
Table 5
COMPARATIVE REVIEW OF THE KNOWN CLASSIFICATIONS OF INTRATHORACIC THYROID MALPOSITIONS

<table>
<thead>
<tr>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Retrosternal (&lt;50%)</td>
<td>subternal</td>
<td>-</td>
<td>-</td>
<td>Cervico-medial</td>
<td>Retrosternal</td>
<td>Subternal</td>
<td></td>
</tr>
<tr>
<td>Substernal (50-80%)</td>
<td>Struma pseudoendothoracica</td>
<td>Partial intrathoracic</td>
<td>Secondary intrathoracic</td>
<td>Mediastino-cervical</td>
<td>&gt;50% intrathoracic</td>
<td>Partially intrathoracic</td>
<td>Cervico-medial</td>
</tr>
<tr>
<td>Intrathoracic (80%) + choristomas</td>
<td>Struma endothoracica falsa + s.endothoracica a vera</td>
<td>Complete intrathoracic</td>
<td>Primary intrathoracic including the aberrant goiter</td>
<td>Mediastinal (100%)</td>
<td>Intrathoracic (100%) + aberrant</td>
<td>Largely intrathoracic</td>
<td>Aberrant</td>
</tr>
</tbody>
</table>

symptoms before surgery is between two months and 48 years, 5-15 years in average.

The main problems are with the respiratory tract where breathing symptoms are predominant. Tracheal compression and deviation most frequently bring about different symptoms, which usually surface together: dyspnea, stridor, unproductive cough and characteristic "short breath", repeated and long lasting infections of the respiratory tract. Sometimes, dyspnea during the night and postural expression of symptoms are typical, when patient in order to avoid breathing problems can only sleep lying on one side of his body.

Dysphagia is a result of esophageal compression but its deviation is more commonly expressed without symptoms. Hoarseness is a consequence of compression or more often of over stretching of recurrent laryngeal nerves, but laryngeal examination cannot always verify the paralysis or paresis of the vocal cords.

There was no statistically significant differences in expression of commonly observed symptoms (dysphagia, stridor, dyspnea) between the two groups of intrathoracic goiters (80% and choristomas) which justified their joint review.

Syndrome of the superior caval vein was intensively expressed (including the downhill varices) only in one patient with papillary thyroid cancer who was not included in this series and that was the only case among almost 2000 patients surgically treated for thyroid diseases of different etiology in a period of 12 years. In patients with benign intrathoracic goiters, latent superior caval vein syndrome was observed only in one case and that might have been provoked by Penborton's maneuver but in the same patient the downhill varices were found (Fig. 6). Despite their impressive dimensions, slow growing of intrathoracic goiters rarely caused the superior caval vein syndrome. With occurrence of sudden development of the syndrome, bleeding in the goiter or its fast growing due to malignant alteration should be considered.

Diagnosis of intrathoracic goiters is based on clinical presentation and a number of procedures. In pre-operative diagnostic assessment standardly used procedures are: thyroid function investigations, neck and chest radiographies, ultrasound, endoscopic ultrasound, thyroid gland scintigraphy, esophagography and esophagoscopy, angiography, CT and MRI scans, "large needle" and "fine needle" biopsies, lung scintigraphy, lung function investigations, laryngoscopy and combined examinations. Relying on the literature, one can state that only in several cases thyroid lymphography, venography, radionuclid venacavography and IC-graphy were used and they are of little value in diagnostic assessment but might be important in order to prove an infiltration or compression of the vein or lymph system.

Although a standardized approach to necessary diagnostic procedures is not established, chest rendenography and CT scan can yield the maximum information with no need for expensive procedures. Rendengraphy can show a mediastinal mass with tracheal deviation or compression and sometimes reveals yet asymptomatic intrathoracic goiters. Standard chest radiography is most frequently used diagnostic procedure due to its low costs and hence it is exclusively used in a routine diagnostic assessment.

CT and MRI scans of the neck and chest reveal the relationships between the trachea and esophagus; depth of goiter invasion; clear continuity with cervical thyroid gland; they define the borders precisely; show the calcifications in goiter (present in 25%-31% of cases) and inhomogeneity in gland. In order to explain symptoms, prove malignant alteration and infiltration of different organs: esophagography, esophagoscopy and bronchoscopy could be used.

Thyroid scintigraphy is standardly used and it is essential in distinguishing nature of the mediastinal mass. However, results depend on functional activity of the thyroid gland localization and depth of the mass and applied radionuclide substance. Accuracy of scintigraphy in revelation and distinction of intrathoracic goiters is 16%-94%, 70% averagely and was also confirmed by our experience.
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Location of intrathoracic goiters is mainly in the anterior but 10%-20% of goiters are located in the posterior mediastinum. Our results show the equal distribution.

Therapy of choice in treatment of intrathoracic goiters is surgical, even in asymptomatic cases. There is a lot of reasons for such an attitude: 1) a treatment of the large goiter with thyroxine, radiotherapy or radiolabeled iod has no effect while, in the same time, it may cause serious complications, 2) there is a risk of sudden development of compressive syndromes, especially the airway obstruction, 3) there occurred sudden deaths caused by fast growing, degeneration, hemorrhage or inflammation, 4) postoperative treatment with l-thyroxine doesn’t reduce the incidence of multinodular non-toxic goiters, 5) an appearance of cancers is more frequent and also of hyperthyroisis, according to some authors, and 6) low surgical morbidity and mortality.

Operative treatment, timely performed, might significantly reduce the incidence of intrathoracic goiter appearance and a necessity for alternative approaches.

Operative approach brings about certain number of undesired effects. That’s the reason why most authors prefer the cervical approach, being less extensive. Furthermore, according to some authors, compared with total number of operative procedures for thyroid diseases, thoracic approach was needed in 0%-24%. Such a span of frequencies is a consequence of different criterions in goiter definition.

Cervical incision is certainly an approach of choice for retrosternal and substernal goiters and we agree with other authors that the alternative approach (sternotomy or thoracotomy) is indicated only in 1% cases from all intrathoracic goiters. However, our experience reveals that thoracic approach is obligatory in as many as 93% of intrathoracic goiters and in 100% of choristomas. The experiences of other authors are quite similar. This explains why Lamke’s definition that intrathoracic goiters are the goiters which demand thoracic approach, is good. The best confirmation of our standing is a low frequency of operative complications which do not differ comparing with the procedures on the cervical thyroid gland. Results of some authors, like our own, showed significantly higher frequency of complications with cervical incision only if one compares them to the combined approach. Because of that, we think that common work of the thyroid and the thoracic surgeon and timely chosen approach (or widen cervical approach with thoracic) are important in order to reduce the frequency of operative complications.

Lateral thoracotomy frequently used in the past is recently replaced with partial or total sternotomy, although, there are authors who emphasize advantages of anterior and especially lateral thoracotomies in operative treatment of choristomas and goiters located in posterior mediastinum.

Some surgeons recommend the initial thoracotomy as the best solution. However, there is a lot of shortcomings in such application: difficult verification of the inferior thyroid vessels, difficult identification and protection of
the laryngeal recurrent nerves, inability to intervene on the cervical goiter without changing position of patient and separate cervical incision. The best choice is to start an operation with cervical incision and, if necessary, to continue with mediastinal sternotomy which enables an excellent exposition of all mediastinal structures. Sternotomy is obligatory: 1) if there is a need for extensive traction in order to prepare the laryngeal recurrent nerves, inferior thyroid vessels and parathyroid glands, 2) when the inferior border of the thyroid gland can not be palpable through the cervical incision, 3) for operation of intrathoracic goiter recurrences, 4) for surgical treatment of intrathoracic goiter after formerly performed procedure on the cervical gland, 5) if there is a need for urgent tracheal decompression, 6) with occurrence of superior caval vein syndrome, 7) malignant alteration, 8) anomalies of the blood vessels, 9) with occurrence of adhesions and expresssive intra- and extra-parenchymatous degeneration and inflammation, 10) for intrathoracic goiters located in the posterior mediastinum, for contralateral, retrotracheal and retroesophageal isolated mediastinal goiters with insignificant connections to the cervical gland, and 11) in cases of uncertain pre-operative diagnosis. There is no significant difference between exclusive application of the cervical incision and the combined approach measured by rate mortality, morbidity and duration of hospital stay.

As early as in 1901, Kocher described the special forceps-es and spoons for intrathoracic goiters extraction through the cervical incision but this technique wasn't widely accepted, neither were the later attempts in construction of the newer instruments. The reasons are numerous: 1) difficult bleeding control when the tissue is crumpled or extirpated in pieces, 2) possible injuries of the important intrathoracic structures, 3) impossible identification of rarely but possibly involved blood vessels that domina-ntly vascularize the goiter and could be direct branches of the aorta, subclavian artery, internal mammary artery or intercostal arteries or are in a form of the important "parasitic vessels" - all this may result with catastrophic bleeding, 4) danger from incomplete removal of thyroid tissue, and 5) risk of oversight of malignancy or insufficient radicalism in cases when cancer is there. More recently, a necessity for aggressive approach and radical surgical procedure, even in benign intrathoracic goiters, has been emphasized. Such a standing is justified because of: 1) possible fast growing of the tissue's remnant which cannot be controlled conservatively, 2) higher frequency of occult cancers in intrathoracic goiters, 3) significantly higher frequency of serious complications in reoperative procedures, 4) insignificantly higher frequency of complications in the specialized institutions when one compares the total and the subtotal thryeotomies. According to some authors, total thryeotorny is a procedure of choice in treatment of benign, nodular cervical and intrathoracic goiters. There are authors who support the preservation of normal thyroid lobe in older patients in order to prevent the postoperative hypothyroidism and some others recommend the "near total" thryeotomies. We agree with authors who recommend total thryeotomies, but not at any price: total lobectomy is definitely obli-gatory with contralateral subtotal lobectomy.

Results of surgical treatment are excellent, with minimal mortality and morbidity. If malignant alteration is not there, a prognosis is good in all cases. All complications of operative treatment might be divided on the "major" complications: vocal cord paralysis, permanent hypoparathyreoidism, bleeding, pneumonitis; and the "minor" complications: transient vocal cord paralysis, transient hypocalcemia, atelectasis and wound infections. Those complications have been thoroughly analyzed, and many others have been also described. Total frequ-
Intra and postoperative problems with tracheomalacia and tracheal collapse have been described extensively and their treatment consisted of prolonged intubation, temporary tracheostomy, and application of the Marlex nets or plastic rings all around the trachea and tracheal suture to the soft tissues of the neck. However, taking into account all of these experiences, Green et al. concluded that prolonged intubation for several days are quite sufficient and a demand for tracheostomy are extremely rare. Airway obstruction and prolonged intubation have not been always connected to the bilateral laryngeal recurrent nerve palsy. Tracheomalacia of a lengthy pressure demands intensive post-operative follow-up of such patients and prolonged intubation is necessary in 1.9%–11.4% most frequently in 5% and tracheostomy in 3.4%–5.8% cases. Anesthesiological problems with difficult intubation during introduction of endotracheal anesthesia might be so large that even one death has been reported. Transient post-operative hypocalcemia has been reported in 4%–41.2% in 15% in average and permanent hypoparathyroidism in 1.4%–3% cases.

Permanent vocal cord paralysis due to the laryngeal recurrent nerve lesion has been described in 1.4%–10.3% 7, 15, 19, 24 4% in average and temporary paralysis in 0%–16.7% of cases 6, 8, 18, 20, 21, 25, 27, 32 8% in average. Lung complications could be found in 5.7%–6.7% cases 4, 6, airway obstruction in 3.4%, atelectasis in 3.2%–4.2% 7, 19, pneumonia in 2%–4.2%, pleural effusion in 2.9%–6.5%, lung thromboembolism in 2.9%–4.2% 19, 25 and lung disfunction in 3.2%. Lung thromboembolism is mainly caused by phlebothrombosis of the lower limbs that might be found in 1.5%–4.2% patients 3, 32, 33.

Cardiac complications, mostly in a form of atrial fibrilations, are present in 4%–6% patients. Serious intra-operative hemorrhage occurs in 5.8%–25% of patients, might be difficult to control if approach is inadequate and, sometimes, might be even cause of death 23. Postoperative hemorrhage is recorded in 3% patients and often requests operative revision that has been applied in one patient. From other wound complications, wound hematoma in 2%–3.4%, wound seroma in 2.9%–7.7% 16, 22, wound swelling in 3.2% and wound infection in 3.2%–3.4% of patients have been described but we didn’t face any of them. Sternal osteomyelitis has been reported in 4%, and mediastinitis in 2.8% of patients, with uncertain prognosis and frequently fatal outcome. Transient dysphagia has been described in 2.9%–16.1% 7, 18, higher body temperature in 12.9%, Horner’s syndrome in 1.9% and lesion of the nerve C-5 in 6.7% of patients.

Frequency of intrathoracic goiter recurrence is 0%–8% 14, 29, 50. Residual goiter after subtotal cervical thyreoidectomy is connected to the former cervical gland with fibrous band, which makes surgical work at the thoracic entrance extremely difficult. Although post-operative death is considered extremely rare in recent decades, frequency of death of 0%–6.9% has been reported 6, 19, 24, 25, 37, 3% in average, mostly due to the lung thromboembolism.
CONCLUSIONS

Intrathoracic goiters are rare, but might present a difficult diagnostic and complex surgical problem. Similar embryological development, common clinical presentation and identical surgical approach in operative treatment justify the common review of the two groups of intrathoracic goiter.

With good selection of patients, adequate and timely performed surgical approach and multi-disciplinarian access in specialized institutions, frequency of complications in operative treatment of intrathoracic goiter is not higher if compared to operative treatment of non-intrathoracic goiter. Combined approach is more comfortable, permits better hemostasis, exploration, surgical radicalism and enables avoidance of injuries of the important structures.

REZIME

INTRATORAKALNE STRUME: ANALIZA 21 BOLENSKA

Strume su podejljene na cervikalne, retrosternalne, substernalne in intratorakalne. Cilj istraživanja je analiza intratorakalnih struma (ITS) pod kojima se podrazumevajo strume sa više od 80% tireoidnog tkiva u grubom košu i intratorakalni tireoidni horistomi. U prospektivnom neredomiziranom istraživanju analiziran je 21 uzastopni operisani bolesnik sa intratorakalnom benignom netoksičnom strumom u periodu 1987-98. god. i to: 14 bolnika sa intratorakalnom strumom (više od 80% tkiva u granom košu) i sedam bolesnika sa intratorakalnim horistomom. Ove dve grupe su analizirane u odnosu na posledice simptomologiju i potreban hirurški pristup, a komplekcijske njegovih operativnog lečenja su uporedjene sa kompleksom operativnog lečenja 986 ne-ITS, benigne, netoksične strume.

ITS čine 1,1% svih operisanih bolesnika sa oboljenjem štitaste žlede. Trećina bolesnika sa ITS su asimptomatski, a najčešći simptomi su: dispejija, stridor i disfagija. Ne postoji značajna razlika u ispoljavanju ovih simptoma između dve grupe ITS. Kod 19% bolesnika je postavljena tačna preoperativna dijagnoza. Cervikalni pristup sa sternotomiom je primenjen kod 11 bolesnika, cervikalni pristup sa desnom torakotomiom kod sedam, samo desna torakotomiya kod dva i samo cervikalni pristup kod jednog bolesnika. Torakalni pristup je bio neophodan kod 95% bolesnika, bez značajne razlike između dve grupe ITS. Od operativnih komplikacija kod dva bolesnika je uočena prolazna pareza glasne žice i kod jednog postopekativno krvarenje. Statistički nije značajna razlika učestalosti operativnih komplikacija kod bolesnika sa ITS i ne-ITS.

ITS su retke, ali mogu predstavljati veliku dijagnošku i složen hirurški problem. Zajednička klinička slika i istovetan hirurški pristup opravljaju skupno prikazivanje ove dve grupe ITS. Sa adekvatnim i pravovremenim hirurškim pristupom, u specijalizovanim ustanovama, učestalost komplikacija operativnog lečenja ITS nije veće u porodjenju se operativnim lečenjem ne-ITS.

REFERENCES


