Thyroid resection procedures are the most common endocrine surgery procedures in Poland; an estimated 25 000 procedures are performed annually. Long term patient outcomes are rarely analyzed.

The aim of the study was to assess effect of complicated thyroid surgery procedures on personal and professional life of patients.

Material and methods. Follow-up of patients with complications was conducted according to a predetermined protocol involving survey and biochemistry.

Results. Unilateral and bilateral vocal cord paralysis accounted for 69% and 8% of complications, respectively. The complications resolved unilaterally in 58% of patients with bilateral vocal cord paralysis. Persistent hypoparathyroidism accounted for 26% of cases of postoperative hypoparathyroidism. Following thyroid resection procedures all patients received supplementation of thyroid hormones and were monitored by an endocrinologist until their follow-up examination. Eighty eight percent patients with vocal cord paralysis were treated at an outpatient department of laryngology and/or speech therapy. Physical therapy resulted in improvement irrespective of final nature of the complications. Vocal cord paralysis or both complications concurrently result in marked prolongation of absence from work and resulted in disability pension in 15% of professionally active patients. Low level of adaptation to disease was found in 19% patients in the study group, while low score on Satisfaction with Life Scale (SWLS) was found in 17% patients in the study group, irrespective of the type of complication.

Conclusions. Acceptance of complications after thyroid surgical procedures is difficult for patients and worsens their life satisfaction in the long term follow-up and adversely modifies their professional and personal life.

In the long term perspective, persistent hypoparathyroidism is more burdensome for patients than recurrent laryngeal nerve injury. Chronic deficit of innervations does not require chronic substitution or specialist therapy that are necessary in the persistent hypoparathyroidism.

Key words: thyroid surgical, vocal cord paralysis, post-operative hypoparathyroidism
occurs in approximately 4-10% of patients and can be transient or permanent.

Postoperative hypoparathyroidism occurs in as many as 30% patients undergoing surgical treatment and can manifest as asymptomatic hypocalcemia or symptomatic hypocalcemia. It is transient in a significant percent of patients undergoing surgical treatment and most commonly can persist for approximately 2-4 weeks after the surgical procedure to as many as two years.

Initial management of postoperative vocal cord paralysis should focus on maintenance of patency of upper airways. In approximately 0.2-1.2% of patients airway patency cannot be maintained and these patients require tracheostomy or a procedure of vocal cord laterofixation soon after the surgical procedure.

At the initial stages, treatment of vocal cord paralysis is based on pharmacological therapy in combination with physical therapy (galvanic stimulation, calcium ionophoresis, potassium ionophoresis, diathermy and inhalations). Early voice rehabilitation is an important part of treatment of vocal cord paralysis. This rehabilitation is based on physiological principles of respiration, phonation and articulation using dynamic respiration and techniques of voice emission, techniques of motor laryngeal rehabilitation and the vocal-phonetic method. Most often patients with bilateral vocal cord paralysis, most often in adduction, with ventilation abnormalities, are qualified to surgical treatment. Most commonly a surgical procedure is performed after 6 months, excluding patient with marked respiratory obstruction, waiting for possible recurrence of nerve function and using concomitantly methods of conservative treatment. The most common procedures include posterior chordectomy, partial medial arytenoidectomy and vocal cord laterofixation.

Treatment of hypoparathyroidism should commence as early as possible, preferably before clinical symptoms of hypoparathyroidism occur. Algorithms of detection of patients with asymptomatic hypoparathyroidism are used in many centers. Intraoperative determination of PTH concentration after removal of both thyroid lobes or immediately after the surgical procedure and calcium monitoring 24 hours after the procedure are the most recommended methods. Reduction of PTH concentration below 10 ng/ml is associated with marked risk of parathyroid injury and if such value is found intraoperatively, parathyroid autotransplantation should be considered. Pharmacological treatment is limited to oral calcium supplementation and intravenous calcium supplementation in symptomatic cases as well as vitamin D supplementation. Long term pharmacological treatment should also involve hydrochlorothiazide, in particular when hypercalciuria or nephrolithiasis are found. Diet with limitation of phosphate and/or implementation of phosphate binding agents (aluminium hydroxide, sevelamer) are indicated in cases of hyperphosphatemia.

In patients treated for hypoparathyroidism, recommended monitoring serum calcium, phosphate, creatinine and urinary calcium concentration should be performed every 6 months and ophthalmological examination annually to enable early cataract detection.

Available literature rarely presents the outcome of patients who underwent thyroid surgery in a collective manner, to present complete panel of problems that these patients encounter, in particular years after the surgical procedure. Few reports (11, 12) present effect of complications on personal and professional life of patients – disease acceptance and limitations associated with it. No report has been found that would deal with problems of patients with access to specialist care in the post-hospitalization period. Polish literature exceptionally rarely touches on the problems of voice rehabilitation, physical therapy of patients with vocal cord paralysis and requirement for complex therapy.

Understanding the basic sequelae of complications, their effect on patient’s outcomes, personal, professional life, difficulties with access to specialist and complex treatment seems indispensible for the surgeon who undertakes surgical treatment of thyroid diseases and is unable to avoid complications despite undertaking every possible precaution.

The aim of this study was to assess effect of complicated thyroid surgery procedures on personal and professional life of patients.

MATERIAL AND METHODS

Between 2002 and 2007, 756 patients including 658 females (87%) and 98 males
(13%) underwent thyroid surgery due to benign thyroid disease at the Clinical Department of General, Oncologic and Endocrine Surgery District Hospital in Kielce. One or both complications occurred in 69 patients, including 64 females (92.7%) and 5 males (7.3%).

Follow-up was scheduled for patients who developed complications after surgical treatment of the thyroid gland. This follow-up consisted of a few modules involving e.g. diagnostic survey including:

- a questionnaire examining treatment of a complication following hospital discharge (duration, type and availability of specialist care, method of treatment of a complication), effect of the complication on professional career (duration of inability to work, requirement for change or modification of work),
- The Satisfaction with Life Scale and Acceptance of Illness Scale – assessment of effect of the disease on personal and family life. Furthermore thyroid stimulating hormone activity and concentration of sodium, potassium ions, total calcium, magnesium and inorganic phosphate was monitored.

The Satisfaction with Life Scale (SWLS) evaluates well-being as one of the items of health. This scale provides a satisfaction with life score (13).

The Acceptance of Illness Scale (AIS) is used to assess consequences of poor health, i.e. limitations resulting from an illness, perception of patient’s own worth, self-sufficiency and dependence on others. The score is presented as a total score and can be related to averages available in the literature for various clinical groups (14).

Scheduled follow-up was performed in 42 patients (60.8%). Average duration of follow-up was 1551 days (minimum 808, maximum 2846, median 1299.5).

Statistical testing of the study results involved Tukey’s and Duncan’s tests.

RESULTS

Complications occurred in 69 patients of the group of 756 patients (9.1%) who underwent surgical treatment between 2002 and 2007. Hypoparathyroidism (41 patients (5.4%)) was the most common complication. Unilateral vocal cord paralysis was found in 17 (2.2%) patients, while bilateral vocal cord paralysis occurred in 16 (2.1%) subjects.

Follow-up examination demonstrated that unilateral vocal cord paralysis (n = 13) was permanent in 9 patients (69.2%) and transient in 4 patients (30.8%). In the group of patients with bilateral vocal cord paralysis (n = 12), the unilateral resolution of this complication was found in 7 patients (58.3), complete resolution in 4 (33.3%) patients and was persistent in one subject (8.3%).

Permanent hypoparathyroidism accounted for 25.9% of cases of postoperative hypoparathyroidism (n = 27) (tab. 1).

In the group of 42 patients who underwent follow-up, symptomatic unilateral vocal cord paralysis occurred in 5 (11.9%) patients after the hospital discharge (within 2 weeks after the procedure).

Lower total calcium and higher inorganic phosphorus (although within the reference range) were found in patients with permanent hypoparathyroidism than in patients without abnormal parathyroid function during follow-up testing. Despite that there were no statistically significant differences between the patient subgroups (tab. 2).

<table>
<thead>
<tr>
<th>Type of complication</th>
<th>Number of complications at discharge</th>
<th>Number of transient complications at follow-up</th>
<th>Number of permanent complications at follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypoparathyroidism</td>
<td>26</td>
<td>20</td>
<td>7</td>
</tr>
<tr>
<td>Unilateral vocal cord paralysis</td>
<td>8</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>Bilateral vocal cord paralysis</td>
<td>12</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Permanent unilateral vocal cord paralysis as a sequelae of bilateral paralysis</td>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>46</td>
<td>28</td>
<td>24</td>
</tr>
</tbody>
</table>

1 – one complication was found after discharge; 2 – five complications were found after discharge
Almost all patients were subjected to endocrinological follow-up in the long term after the surgical treatment of the thyroid gland (98%) irrespective of the type of complication. Patients with postoperative hypoparathyroidism attended follow-up visits every 3 to 6 months, while the other patients every 6 to 12 months. All patients with permanent hypoparathyroidism received calcium and vitamin D supplementation at the time of testing.

In the group of patients with unilateral or bilateral vocal cord paralysis, 48% of patients were treated by a laryngologist, 20% by a speech therapist, and 20% by a laryngologist and speech therapist. A total of 22 subjects (88%) from 25-subject group of patients with injury of the recurrent laryngeal nerve used laryngological and/or speech therapy follow-up. Laryngological follow-up was on average twice longer than speech therapy follow-up (10.6 months versus 5.4 months). Patients with permanent complication attended laryngologist’s office on average for 13.1 months, speech therapist’s office for 7.5 months, while average time of treatment was 2.5 and 2.6 months, respectively, in patients with transient complications. Furthermore percentage of patients attending laryngologist’s and/or speech therapist’s office was different depending on the nature of the complication and was 75% and 94.1% for transient and permanent complication, respectively (tab. 3).

Among patients undergoing the survey, satisfaction with access to specialist care was on average 5.6 on a 10-point scale. Most patients complained of long waiting time for a specialist advice. Patients with hypoparathyroidism had the worst satisfaction (average score 4.9, for patients with permanent hypoparathyroidism 4.4) (tab. 4).

Thirteen (52%) patients with vocal cord paralysis attended physical therapy. All patients attending physical therapy reported improvement after therapy. Four patients received physical therapy and voice rehabilitation sessions during 1-2 weeks of hospitalization at the department of laryngology.

<table>
<thead>
<tr>
<th>Complication</th>
<th>TSH (µIU/ml)</th>
<th>Na+ (mEq/l)</th>
<th>K+ (mEq/l)</th>
<th>Magnez / Magnesium (mg/dl)</th>
<th>Total calcium (mEq/l)</th>
<th>Inorganic phosphate (mg/dl)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chronic hypoparathyroidism</td>
<td>2,400</td>
<td>139.5</td>
<td>4.25</td>
<td>1.96</td>
<td>4.42</td>
<td>4.35</td>
</tr>
<tr>
<td>Chronic hypoparathyroidism and vocal cord paralysis (permanent/transient)</td>
<td>1,754</td>
<td>140</td>
<td>4.6</td>
<td>1.93</td>
<td>4.85</td>
<td>3.9</td>
</tr>
<tr>
<td>Transient hypoparathyroidism</td>
<td>1,051</td>
<td>140</td>
<td>4.4</td>
<td>2.08</td>
<td>4.79</td>
<td>3.3</td>
</tr>
<tr>
<td>Transient hypoparathyroidism and vocal cord paralysis (permanent/transient)</td>
<td>1,934</td>
<td>137</td>
<td>4.1</td>
<td>1.87</td>
<td>4.76</td>
<td>3.4</td>
</tr>
<tr>
<td>Vocal cord paralysis</td>
<td>1,505</td>
<td>140</td>
<td>4.5</td>
<td>1.94</td>
<td>4.97</td>
<td>3.5</td>
</tr>
</tbody>
</table>

Reference ranges: TSH (µIU/ml) – 0.340-5.600; Na+ (mEq/l) – 137-146; K+ (mEq/l) – 2.50-5.20; magnesium (mg/dl) – 1.60-2.30; Total calcium (mEq/l) – 4.50-5.50; inorganic phosphorus (mg/dl) – 2.50-4.80

Table 3. Duration of specialist laryngologist’s and speech therapist’s follow-up

<table>
<thead>
<tr>
<th>Complication</th>
<th>Duration of specialist follow-up (months)</th>
<th>Number of patients attending laryngologist’s and/or speech therapist’s follow-up</th>
<th>Percentage of the study group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permanent vocal cord(s) paralysis (n=17)</td>
<td>median 12, average 13.1, min. 1, max. 48</td>
<td>9† 4‡</td>
<td>94.1%</td>
</tr>
<tr>
<td>Laryngologist</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Speech therapist</td>
<td>3</td>
<td>7,5, 1, 24</td>
<td>52.9% 23.5%</td>
</tr>
<tr>
<td>Transient vocal cord(s) paralysis (n=8)</td>
<td>6</td>
<td></td>
<td>75.0%</td>
</tr>
<tr>
<td>Laryngologist</td>
<td>2.5</td>
<td>2.5, 1, 4</td>
<td>37.5% 12.5%</td>
</tr>
<tr>
<td>Speech therapist</td>
<td>3</td>
<td>2.6, 2, 3</td>
<td>25.0%</td>
</tr>
</tbody>
</table>

1 – laryngologist’s follow-up; f – speech therapist’s follow-up; †+f – laryngologist’s and speech therapist’s follow-up
None of the patients was subjected to surgical treatment in relation to their complication; neither subject required tracheostomy or surgical dilatation of glottis.

Complications after thyroid surgery affected professional life of patients. Seventy-four percent of patients continued to work after a period of absence that was on average 82 days. Longer average absence was observed in patients with vocal cord paralysis and in patients with concurrent vocal cord paralysis and postoperative hypoparathyroidism. It was 115 and 97 days, respectively. Patients with hypoparathyroidism returned to work after on average 43 days (tab. 5).

Four subjects received disability pension (15% of professionally active subjects) – these were the subjects with one or two coexisting complications. An average age at the time of receipt of disability pension was 48.5 years. Three persons retired early (11% of professionally active subjects). An average age was 59 years.

In a survey assessing patient adaptation to the disease, 19% subjects reported that they had problems with adjustment to limitations related to the disease, 24% claimed they were unable to do what they liked the most, 16.7% did not feel as independent as they wanted to be. Eight (19%) patients had patient adaptation below an average score for the chronically ill patients. Similarly low satisfaction with life on SWLS scale was found for 7 (16.7%) patients. Both indices did not depend on the type of complication.

### DISCUSSION

The presented study analyzed outcomes of patients after thyroid surgical procedures due to benign diseases complicated by postoperative hypoparathyroidism and vocal cord paralysis.

Complication rate in the group of 42 patients with vocal cord paralysis and/or hypoparathyroidism was similar to results presented by other authors (15, 16). Quite high incidence of bilateral vocal cord paralysis in the postoperative period (2.1%) was markedly lower in the follow-up period with unilateral resolution of this complication in 7 (58.3%) patients and complete resolution in 4 (33.3%) patients. This complication was permanent in one subject (8.3%).

Possible occurrence of symptoms of vocal cord paralysis after the discharge is related to occurrence of asymptomatic complication at the time of discharge or later injury of recurrent laryngeal nerve resulting from edema, hematoma or scar formation. Vocal cord paralysis was found in five patients with hypoparathyroidism in the follow-up testing. This problem may be relevant for patients in whom postoperative hypoparathyroidism has been diagnosed. There are multiple common risk factors of these complications. This may favor simultaneous occurrence of both these complications. In our study 23.8% patients had both these complications. This fact should prompt routine laryngoscopic examination prior to discharge in patients after thyroid surgery (17). Currently assessment of vocal cord mobility is part of the protocol recommended by International Neuromonitoring Research

### Table 4. Subjective assessment of access to specialist care

<table>
<thead>
<tr>
<th>Complication</th>
<th>Average score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypoparathyroidism (n=17)</td>
<td>4.9</td>
</tr>
<tr>
<td>Vocal cord paralysis (n=15)</td>
<td>6.1</td>
</tr>
<tr>
<td>Vocal cord paralysis and hypoparathyroidism (n=10)</td>
<td>6.0</td>
</tr>
<tr>
<td>Average total score</td>
<td>5.6</td>
</tr>
</tbody>
</table>

(p=0.4014)

### Table 5. Duration of absence after a complication

<table>
<thead>
<tr>
<th>Complication</th>
<th>Duration of absence after a hospital discharge (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>average</td>
</tr>
<tr>
<td>Hypoparathyroidism (n=17)</td>
<td>43,1</td>
</tr>
<tr>
<td>Vocal cord paralysis (n=15)</td>
<td>114,7</td>
</tr>
<tr>
<td>Vocal cord paralysis and hypoparathyroidism (n=10)</td>
<td>97,5</td>
</tr>
<tr>
<td>Total</td>
<td>81,8</td>
</tr>
</tbody>
</table>
Group (18). Early detection of this complication enables implementation and targeting of treatment (19).

Incidence of postoperative hypoparathyroidism is higher than of vocal cord paralysis. Its incidence was 5.4% in our study. According to various authors, incidence of this complication may be as high as 30% and increases with increased extent of thyroid surgery. This permanent complication occurs in 0.1% to 5% of patients (20, 21).

Few publications (22, 23) related to the problem of medical treatment of vocal cord paralysis point out an important role of physical therapy and speech exercise. Early treatment alleviates symptoms of this complication (moisturizing of larynx) and facilitates nerve regeneration, and enables patient communication with the surrounding, improves muscle coordination and maintains efficiency of cri-coarytenoid joint. Necessary patient and the treating involvement are emphasized. Complex, often burdensome treatment, requires involvement of both patient and his/her therapist. Most commonly reported difficulties include inability to follow the instructions and inability to follow frequent laryngological and speech therapy follow-up visits, long treatment duration and lack of self discipline in speech exercises. These are the reasons for which patients abandon treatment of this complication. According to available literature (24), good treatment results were obtained most commonly after 6 months of outpatient treatment. Our study group included inpatients from the department of laryngology where they underwent rehabilitation and physical therapy sessions. All patients positively assessed effects of inpatient treatment on improvement of vocal cord function. No one from the study group was treated at a sanatorium. Beneficial effects of treatment at a sanatorium on patients with vocal cord paralysis reported in the Polish literature need to be emphasized (25). This is related to improved efficiency of laryngeal muscles and respiratory efficiency and moisturizing of mucosal membranes. The treatment results in improved voice efficiency, formation of basic voice frequency and improvement of its dynamics.

Patient outcomes after the discharge depend predominantly on the type of complication. All patients require endocrinological follow-up and treatment of postoperative hypoparathyroidism. Endocrinologist provides complex care to hypoparathyroid patients, offered most commonly by the same physician as treated them before the surgical procedure. Percentage of patients with postoperative hypoparathyroidism who remained in the ongoing endocrinological follow-up, was 94%. This result can be considered satisfactory. No statistically significant changes in plasma electrolytes (sodium, potassium, magnesium, calcium, phosphate ions) were found between the study groups. Available literature also did not report cases of electrolyte abnormalities with normal correction of thyroid and parathyroid hormonal deficiencies. Parathyroid supplementation therapy can be considered adequate in view of available recommendations. No cases of hypophosphatemia were found in patients with permanent hypoparathyroidism. No cases of coexisting nephrolithiasis or history of cataract treatment were reported either.

The problem of treatment of patients with vocal cord paralysis looked much worse. Their treatment is limited to laryngological follow-up only in 68% of patients, speech therapy in 40% of patients. Only 20% of patients had both these forms of treatment provided. Few publications (22, 23, 24) related to the problem of complex treatment of patients with abnormalities of laryngeal nerve function also emphasize difficulties with complex and early treatment commencement and its continuation.

Duration of laryngological treatment and speech therapy depends mainly on the nature of the complication and was 12 and 7.5 months for the permanent paralysis. It must be emphasized that nonpharmacological treatments of vocal cord paralysis were positively assessed by patients and resulted in at least alleviation of complaints.

During the study patients reported inconveniences with access to specialist care, in particular patients with postoperative hypoparathyroidism (without statistically significant differences between the study groups). This most probably resulted from requirement of frequent endocrinological follow-up with long waiting time for specialist advice. No literature reports were found in the available literature that would describe the presented problem.

Problems after thyroid surgery are associated with a number of consequences for both
Effect of complicated thyroid surgical procedures on personal and professional life of patients and worsening of patient’s well-being. Vocal cord paralysis has enormous consequences for people who use their voice in work or in pursuing their interests (e.g. singing). Vocal cord paralysis impairs respiratory efficiency and leads to feeling of continuous fatigue caused by excessive respiratory work. Worsening of voice quality or its lack causes communication problems in family and professional life. Problems reported by patients with postoperative hypoparathyroidism are related to required ingestion of high quantities of calcium and vitamin D supplements. Furthermore these patients experience anxiety caused by the disease symptoms (11).

In the group consisting of 42 subjects median absence from work among patients with hypoparathyroidism was 30 days. This was 135 days in patients with vocal cord paralysis, although in sporadic cases this was 6 months. Vocal cord paralysis was the cause for obtaining disability pension by 15% of patients (50% of them also had hypoparathyroidism). Furthermore 11% of patients decided to retire early. Available literature does not report any analysis of effect of complications after surgical treatment of thyroid diseases on professional life of patients.

Twenty percent of the study group admitted that they have problems with illness adaptation. Patients with both these complications simultaneously, irrespective of the nature of the complication, accounted for 50% of this group. Vocal cord paralysis at an early stage is difficult to accept by the patient and markedly impairs his/her functioning. These patients are often discharged from the hospital with symptoms of complications. During the treatment many of these patients shorten the treatment and interrupt it, accepting the complication. Patients with postoperative hypoparathyroidism seem content with resolution of symptoms of this disorder at the time of discharge from the hospital. Later they find out that treatment of this complication is prolonged, requires continuous calcium and vitamin D supplementation as well as follow-up at an outpatient department of endocrinology. Treatment discontinuation indispensably results in occurrence of unpleasant symptoms that could be life threatening. We did not find any reports in the available literature that would extensively report on the problem of patient adaptation to this complication and effect on this complication on patient’s life. Few reports (11) emphasize psychological aspects of treatment of complications and suggest that further studies are needed. One of the studies in 25 women with chronic hypoparathyroidism found more common anxiety, fear, phobia and their somatic equivalents versus control group.

As the presented study indicates, the problem of complications of thyroid surgical procedures is significant both for the treating team as well for the patient. When a complication occurs, it requires individual approach to the patient, patient education with regard to therapeutic management and possible consequences for health, personal life and relations with others. When vocal cord paralysis occurs, requirement for complex and long-term treatment by endocrinologist, laryngologist and speech therapist must be explained to the patients. When it is suspected that such treatment is impossible due to patient-related constraints (age, co-morbidities, remote place of residence), hospital treatment or treatment at a sanatorium should be considered.

Regular follow-up in the outpatient setting increases efficacy of treatment of a complication and constitutes support for the patient.

CONCLUSIONS

1. Patients find it difficult to accept complications of thyroid surgery that impairs their satisfaction with life and adversely affects their professional and personal life in the long term.
2. Patients with complications require marked intensification of care and treatment as compared to the study group, which may result in reduction of adverse consequences of complications for satisfaction with life and professional and personal outcomes.
3. Permanent hypoparathyroidism in the long term perspective is more burdensome for patients than injury of the recurrent laryngeal nerve. Chronic innervation deficit does not require chronic substitution or specialist treatment that are required in permanent hypoparathyroidism.
REFERENCES