Thyroid Surgery in the Geriatric Patient

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Background: Although age itself is no contraindication for major surgical procedures, few patients 75 years and older undergo thyroid surgery.

Hypothesis: Thyroid surgery in the geriatric patient can be performed with low morbidity and mortality.

Design: Retrospective analysis of prospectively documented data.

Setting: University hospital referral center.

Patients: We included 738 patients undergoing thyroid surgery within 5 years, of whom 55 (7.5%) were 75 years or older (group 1) (mean±SD age, 79.9±4.1 years).

Main Outcome Measures: Indication for surgery, surgical strategy, morbidity, and mortality were analyzed and compared with those in younger patients (<75 years; group 2).

Results: Malignancy was suspected or verified in 29 patients (52.7%) in group 1; 21 (38.2%) had mechanical symptoms due to large bilateral nodular goiters; and 5 (9.1%) presented with benign nodular goiter. The main indication in group 2 (n=683) was benign nodular goiter in 455 (66.6%); 142 patients (20.8%) presented with suspected malignancy and 21 (3.1%) with mechanical symptoms (P<.001). Most patients underwent total thyroidectomy, hemithyroidectomy, or near-total thyroidectomy (n=50 [90.9%; group 1] vs n=597 [87.4%; group 2], P=.53). Frequency of malignancy was higher in group 1 (n=20 [36.4%] vs n=179 [26.2%]; P=.17). Morbidity of thyroid surgery was comparable in both groups. One (2.3%) of 44 patients in group 1 had permanent hypoparathyroidism, compared with 10 (2.0%) of 502 in group 2 (P=.61); permanent recurrent laryngeal nerve paralysis occurred in 1 (1.05%) of 95 nerves at risk in group 1 compared with 3 (0.26%) of 1172 nerves at risk in group 2 (P=.22). There was no perioperative mortality in either group.

Conclusions: Thyroid surgery in patients 75 years or older can be performed with low morbidity. The guarantees for success include an individual risk-and-benefit analysis and careful preoperative preparation.

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An exact definition of the geriatric patient is not available in the medical literature. Publications use different age definitions, eg, 60 years, 65 years, and 75 years.1,2 In 1991, 524769 Austrians were 75 years or older (6.6% of the population). In 2000, this number increased to 589013 (7.25%). The prognostication for the year 2020 is 810809 (10.0%); for the year 2050, 1414833 (18.4%).3 This trend toward a rising proportion of elderly patients is seen in all Western countries.4,5

People who survive to the ages of 70 to 75 years may be expected to live 14 additional years; those who live to the ages of 80 to 85 years, 8 additional years.6 At 75 years of age, the average life expectancies for men and women in the Western world are 9 and 12 years, respectively.7

Although age is no contraindication for major surgery,8,9-12 the willingness of physicians to refer patients for elective surgery diminishes with increasing patient age.13 Do these concerns also apply to thyroid surgery? The following questions arise in this context: (1) Can thyroid surgery in the geriatric patient be performed with low morbidity and mortality? (2) Are morbidity and mortality in the geriatric patient higher than in younger patients? and (3) Do indications for surgery, surgical strategy, and histological diagnoses differ between geriatric and younger patients?

METHODS

Within 5 years (January 1, 1995, to December 31, 1999), thyroid surgery was performed in 738 patients at our institution. Patients were divided into groups: those 75 years or older (group 1) (n=35 [7.5%]) and those younger than 75 years (group 2) (n=683 [92.5%]). Patients in group 1 were defined as geriatric patients. Group 1 consisted of 47 women and 8 men (female-male ratio, 6:1). The mean±SD age was 79.9±4.1 years (median, 78.4 years;
invasive carcinomas infiltrating the recurrent nerve. Five patients in group 1 presented with a preoperative recurrent laryngeal nerve palsy. None of the preoperative palsies improved after thyroid surgery. These preoperatively damaged or intentionally cut nerves were excluded from further analysis, resulting in a total number of 1267 nerves at risk. For calculating the rate of hypoparathyroidism, only bilateral surgical procedures (n=546) were taken into account.

We established the following 3 major indications for surgery: (1) benign goiter, consisting of a solitary cold nodule, a cold nodule in nodular goiter, nodular goiter without a cold nodule, thyrotoxicosis, or unifocal or multifocal autonomy; (2) suspected or verified malignancy, including suspected fine-needle aspiration cytologic findings (follicular neoplasia or suspected papillary carcinoma), clinically suspected carcinoma (rapidly growing cold nodules, suspicious ultrasonographic findings, or suspicious results of palpation), elevated levels of basal calcitonin and abnormally elevated levels of calcitonin secretion after pentagastrin stimulation, biochemically verified medullary thyroid carcinoma, lymph node metastases of papillary carcinoma diagnosed using biopsy findings, or histologically verified thyroid carcinoma (completion thyroidectomy); and (3) mechanical symptoms due to large and often retrosternal goiter.

We also differentiated between radical and nonradical surgical strategies. Radical surgery consisted of total thyroidecomy, near-total thyroidecomy (leaving a unilateral thyroid remnant of approximately 1×1×1 cm), and hemithyroidectomy (under the condition of a completely healthy contralateral lobe). All other procedures were considered nonradical surgery.

Unless otherwise indicated, data are given as mean±SD. Differences were calculated for their statistical significance using the Fisher exact test and regarded as significant if P<.05.

### RESULTS

#### INDICATIONS FOR SURGERY

Indications for surgery in groups 1 and 2 are shown in Table 1. The main indication for surgery in group 1 was suspected or verified malignancy (n=29 [52.7%]), followed by mechanical symptoms (n=21 [38.2%]). These 2 indications were much less frequent in group 2, ie, 207 patients (30.3%) and 21 (3.1%), respectively. In contrast, benign indications were a rarity in group 1 (n=5 [9.1%]) compared with group 2 (n=455 [66.6%]). These differences were statistically highly significant (P<.001).

We also compared the frequency of thyroid surgery owing to recurrent disease. In group 2, 46 patients (6.7%) underwent recurrent thyroid surgery. This proportion was significantly higher in group 1 (n=10 [18.2%]; P=.006).

#### SURGICAL STRATEGY

The surgical strategy in groups 1 and 2 is summarized in Table 2. Most of the patients underwent radical surgical treatment as defined above (group 1, n=50 [90.9%]; group 2, n=597 [87.4%]). We found no significant difference in surgical radicalness between the 2 age groups (P=.53).

#### PATHOLOGY

Definitive diagnosis after histological examination of the surgical specimens disclosed malignancy in 20 (36.4%)
patients in group 1 and in 179 patients (26.2%) in group 2. Thyrotoxicosis was the definitive diagnosis in 4 patients in group 1 (7.3%) and in 90 patients in group 2 (13.2%). The remaining diagnoses included benign nodular goiters or follicular adenomas (group 1, n=31 [56.4%]; group 2, n=414 [60.6%]). We found a trend toward a higher rate of malignancy in group 1 and a higher rate of thyrotoxicosis in group 2, but no statistically significant difference (P=.17). The exact distribution of the various thyroid malignancies is shown in Table 3.

MORBIDITY AND MORTALITY

Fourteen patients (25.5%) in group 1 had some kind of early postoperative complication, compared with 149 (21.8%) in group 2 (Table 4). Early postoperative recurrent laryngeal nerve palsy and postoperative hypocalcemia were the most frequent complications in both age groups.

In group 1, postoperative hypocalcemia developed in 6 (13.6%) of 44 patients. One permanent hypoparathyroidism (2.3%) was observed. In group 2, postoperative hypocalcemia developed in 71 (14.1%) of 502 patients, permanently in 10 (2.0%). These differences were not statistically significant (P>.99 and P=.61, respectively).

The second most frequent complication was early postoperative recurrent laryngeal nerve palsy in 6 (3.5%) of 95 nerves at risk in group 1 and in 46 (3.9%) of 1172 nerves at risk in group 2. This difference was not statistically significant (P=.24). In group 1, only 1 permanent palsy was observed in a patient with a widely invasive papillary thyroid carcinoma (pT4b, pN1a), accounting for 1.05% of the nerves at risk, whereas 3 early nerve palsies in group 2 remained permanent (0.26%). This difference between the age groups also did not reach statistical significance (P=.22).

In group 1, complications other than hypocalcemia and recurrent laryngeal nerve paresis occurred in 6 patients (10.9%), consisting of hematomas requiring surgery in 3 (5.5%), respiratory distress that required transfer to the intensive care unit (ICU) in 2 (3.6%), and wound infection in 1 (1.8%). Further complications in group 2 were hematomas requiring surgery in 24 patients (3.5%), chylous fistula in 4 (0.6%), wound infection in 3 (0.4%), paresis of the brachial plexus in 3 (0.4%), and seroma, postoperative respiratory insufficiency, and pneumonia in 1 (0.1% each, totaling 37 complications (5.4%). We found no statistically significant differences between the 2 age groups (P=.12).

Permanent morbidity occurred in 2 patients (3.6%) in group 1 and 13 (1.9%) in group 2. Perioperative (within 30 days) mortality was 0 in both age groups.

One patient with a poorly differentiated papillary thyroid carcinoma in a large retrosternal goiter underwent complication-free transternal thyroidectomy and presented 7 months later with a metastasis in the sternum. An osseous resection, covering the defect with a muscular flap, was performed. This patient presented with high comorbidity at the time of surgery (history of myocardial infarction, 4-fold aortocoronary bypass graft, arterial hypertension, chronic obstructive pulmonary disease, and type 2 diabetes mellitus). He died 2 days after the reintervention owing to an acute myocardial infarction. Because of this death, the mortality rate in group 1 was 1.8%.

COMORBIDITY IN GROUP 1

Ten patients in group 1 showed no comorbidities (18.2%). Seventeen patients (30.9%) presented with 1 concomitant disorder; 18 (32.7%), 2; and 10 (18.2%), with 3 or more. Cardiovascular disorders were seen the most frequently (n=44 [80.0%]), whereas neurologic (n=9 [16.4%]), metabolic (n=8 [14.5%]), and pulmonary diseases (n=7 [12.7%]) were seen less frequently.

Essential hypertension existed in 29 patients (52.7%) and was the most frequent of the cardiovascular diseases, followed by coronary arteriosclerosis (n=17 [30.9%], 6 of them with a history of myocardial infarction) and cardiac arrhythmias (n=12 [21.8%]). Two patients presented with chronic cardiomyopathy, and 1 patient, with a slight insufficiency of the aortal valve.

Type 2 diabetes mellitus was the most frequent metabolic comorbidity (n=5 [9.1%]), followed by type 1 dia-

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Table 3. Distribution of Histological Types of Malignancies*

<table>
<thead>
<tr>
<th>Histological Findings</th>
<th>Group 1 (n = 20)</th>
<th>Group 2 (n = 179)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTC</td>
<td>5 (25.0)</td>
<td>107 (59.8)</td>
</tr>
<tr>
<td>FTC</td>
<td>3 (15.0)</td>
<td>16 (8.9)</td>
</tr>
<tr>
<td>ATC/ITC</td>
<td>4 (20.0)</td>
<td>7 (3.9)</td>
</tr>
<tr>
<td>MTC</td>
<td>7 (35.0)</td>
<td>36 (20.1)</td>
</tr>
<tr>
<td>MTC + DTC</td>
<td>0</td>
<td>9 (5.0)</td>
</tr>
<tr>
<td>Others</td>
<td>1 (5.0)</td>
<td>4 (2.2)</td>
</tr>
</tbody>
</table>

*Patient groups are described in the “Methods” section.

Table 4. Early Postoperative and Permanent Morbidity*

<table>
<thead>
<tr>
<th>Morbidity</th>
<th>Group 1</th>
<th>Group 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paralysis of the recurrent laryngeal nerve, No. (%) of nerves at risk</td>
<td>6/95 (6.3)</td>
<td>46/1172 (3.9)</td>
</tr>
<tr>
<td>Early postoperative</td>
<td>6/95 (6.3)</td>
<td>46/1172 (3.9)</td>
</tr>
<tr>
<td>Permanent</td>
<td>1/95 (1.05)</td>
<td>3/1172 (0.26)</td>
</tr>
<tr>
<td>Hypoparathyroidism, No. (%) of patients</td>
<td>6/44 (13.6)</td>
<td>71/502 (14.1)</td>
</tr>
<tr>
<td>Early postoperative</td>
<td>6/44 (13.6)</td>
<td>71/502 (14.1)</td>
</tr>
<tr>
<td>Permanent</td>
<td>1/44 (2.3)</td>
<td>10/502 (2.0)</td>
</tr>
<tr>
<td>Other complications, No. (%) of patients</td>
<td>6/55 (10.9)</td>
<td>37/683 (5.4)</td>
</tr>
<tr>
<td>Hematoma</td>
<td>3/55 (5.5)</td>
<td>24/683 (3.5)</td>
</tr>
<tr>
<td>Wound infection</td>
<td>1/55 (1.8)</td>
<td>3/683 (0.4)</td>
</tr>
<tr>
<td>Seroma</td>
<td>0</td>
<td>1/683 (0.1)</td>
</tr>
<tr>
<td>Chylous fistula</td>
<td>0</td>
<td>4/683 (0.6)</td>
</tr>
<tr>
<td>Respiratory distress</td>
<td>2/55 (3.6)</td>
<td>1/683 (0.1)</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>0</td>
<td>1/683 (0.1)</td>
</tr>
<tr>
<td>Paralysis of brachial plexus</td>
<td>0</td>
<td>3/683 (0.4)</td>
</tr>
</tbody>
</table>

*Patient groups are described in the “Methods” section.
Neurologic comorbidity consisted of Parkinson disease (n = 5 [9.1%]), history of cerebral infarction (n = 2 [3.6%]), and anamnestic transitory ischemic attack (n = 2 [3.6%]).

All 7 patients (12.7%) with pulmonary diseases had chronic obstructive pulmonary disease. Five patients showed reduced renal function consisting of a slight pathologic increase of serum creatinine levels above the reference level of 1.4 mg/dL (123.8 µmol/L) (maximum, 1.67 mg/dL [147.6 µmol/L]).

Blood tests indicated hypercholesterolemia (>220 mg/dL [>5.7 mmol/L]) in 27 patients (49.1%) and elevation of γ-glutamyltransferase levels without accompanying elevation of other liver function variables in 3 patients (5.5%).

POSTOPERATIVE COURSE

Seven patients (12.7%) were treated in the ICU immediately after the operation. Three of them underwent overnight monitoring, and 4 with known pulmonary comorbidities were treated in the ICU for 4, 5, 10, and 14 days postoperatively because of postoperative respiratory distress.

Two patients required a tracheostomy. Both had widely invasive thyroid carcinomas (follicular thyroid carcinoma with invasion of the trachea in one and locally advanced anaplastic thyroid carcinoma in the other).

Mean hospital stay was 14.2 ± 7.5 days (median, 13 days; minimum, 4 days; maximum, 47 days). Mean preoperative hospital stay was 4.3 ± 2.7 days (median, 4 days) for all patients, 2.9 ± 2.1 days for patients without comorbidity, 4.2 ± 2.8 days for patients with 1 concomitant disease, 4.9 ± 2.0 days for patients with 2 concomitant diseases, and 4.5 ± 3.4 days for patients with 3 or more concomitant diseases.

FOLLOW-UP OF GROUP 1

Median follow-up was 44 months. Thirty-eight (69.1%) of the 55 patients were still alive, and 16 (29.1%) had died. One patient was lost to follow-up. Nine (45.0%) of 20 patients with thyroid malignancy died owing to the carcinoma (n = 7) or other causes (n = 2; myocardial infarction in one and acute renal failure in the other). Two of the 3 patients with widely invasive follicular thyroid carcinoma (with tracheal invasion and seeding metastases) died 4½ and 5 years after primary surgery. Three of the 4 patients with anaplastic thyroid carcinoma died after 3 months, and the fourth died 2 years 2 months after the primary operation. One patient with thyroid metastasis of a bronchial carcinoma died 9 months after thyroid surgery.

Eleven patients with papillary, follicular, or medullary thyroid carcinomas (2 of whom underwent surgery for recurrence) are still alive. Estimated survival according to Kaplan-Meier for the patients with carcinoma was 70.0% ± 10.2% after 1 year (patients at risk, n = 14), 64.2% ± 10.9% after 3 years (patients at risk, n = 10), and 55.0% ± 12.6% after 5 years (patients at risk, n = 3).

Of the 35 patients with benign histological findings, 7 patients (20.0%) died, with the first death occurring 1½ years after surgery. Estimated Kaplan-Meier survival for these patients was 100% after 1 year (patients at risk, n = 35), 90.3% ± 5.3% after 3 years (patients at risk, n = 20), and 65.2% ± 11.6% after 5 years (patients at risk, n = 7).

The prevalence of thyroid disease increases significantly with age. The nodular quality of the thyroid, fibrosis, and lymphocytic infiltration increase. Indications for surgery and surgical strategy in thyroid nodular disease depend on whether a nodule is benign, malignant, euthyroid, or toxic, or whether a mechanical impairment of adjacent organs exists. Uncomplicated, small, and clinically unsuspicuous euthyroid nodular goiters need not undergo operation but can be followed up over time, whereas large or suspicious alterations of the thyroid should undergo early elective and definitive surgical treatment at any age to avoid acute and eventually complicated interventions.

The effectiveness of surgery in geriatric patients depends on whether it is performed safely, allowing patients to return to productive lives and an improved postoperative life expectancy or at least to a condition that is not diminished by the surgical procedure. Therefore, an individual risk-and-benefit analysis and careful selection are essential in elective surgery, especially in the geriatric patient. Furthermore, among geriatric patients, mortality is much lower in elective compared with emergency surgery. Therefore, minimization of the risks of surgical interventions in the geriatric patient by performing early elective surgery, accompanied by adequate preoperative evaluation and preparation, is essential to avoid emergency interventions.

Each of our geriatric patients underwent surgery because of an absolute necessity, ie, mechanical impairment of adjacent vital organs, thyrotoxicosis refractory to medical treatment, and high suspicion of malignancy. The evidence of careful patient selection in this group is demonstrated by the difference in the distribution of the indications for surgery, which shows a statistically significant higher proportion of patients with suspected or verified malignancy and large goiters causing mechanical symptoms in the geriatric patients compared with the younger ones.

Just 1 (1.8%) of our 35 geriatric patients underwent an emergency intervention because of extreme dyspnea accompanied by inspiratory stridor caused by a large nodular goiter with extensive compression of the trachea. All others were able to undergo evaluation and adequate preoperative preparation (delayed urgency). Mean preoperative hospital stay was 4.3 days in our patients compared with 5.3 days in the study of Steinau et al, whose patients underwent different surgical interventions.

With increasing age, morbidity and mortality after surgery also increase. Terracciano et al demonstrated age greater than 70 years as an independent risk factor for increased morbidity and mortality in a multi-
variante analysis in 1182 patients. From 28 independent studies with a total of 34194 patients, the Colorectal Cancer Collaborative Group found that postoperative morbidity and mortality increase progressively with advancing age. Their median postoperative mortality rate was 3.0% in patients younger than 65 years, 6.4% in patients aged 65 to 74 years, 8.6% in patients aged 75 to 84 years, and 19.4% in patients 85 years and older. On the other hand, Hannoun et al did not find an increased mortality rate in 44 patients older than 70 years undergoing pancreaticoduodenal resection compared with younger patients. Recent publications showed that increasing mortality with advancing age depends on the biological rather than the chronological age and therefore, on the number of comorbid conditions.

Most of these publications concerned major surgery. Few data exist concerning thyroid surgery in the elderly patient. Har-El et al found a 1.9% postoperative mortality rate in 50 patients older than 70 years with thyroid carcinoma. In our study, the mortality rate was 0% for solitary thyroid surgery in either age group. The only patient who died after resection of sternal metastases of a poorly differentiated thyroid carcinoma (after uneventful transsternal thyroidectomy 7 months earlier) presented with numerous concomitant conditions. He had a history of myocardial infarction, the most important cardiac risk factor according to Mehta and Savino.31 The importance of a myocardial infarction in the patients’ history is also underlined by other authors.32-34

Many of our geriatric patients presented with cardiovascular diseases (hypertension in 52.7%, coronary atherosclerosis in 30.9%, and cardiac arrhythmia in 21.8%). Neurologic diseases were seen in 16.4%, metabolic disorders in 14.5%, and pulmonary disease in 12.7% of our geriatric patients. Steinau et al also found cardiovascular diseases to be the most common comorbid condition (45.9%). Hypertension was present in 28.7% of their patients. Compared with our patients, pulmonary (19.4%) and metabolic disorders (16.6%) were seen more frequently, whereas neurologic comorbidity (7.3%) was less frequent. The rate of patients with 2 or more concomitant conditions was higher in our patient population. Of the patients described by Steinau et al, 25.4% had no additional disease, and 37.3% presented with 1. 24.0% with 2, and 14.0% with 3 or more additional disorders, compared with 18.2%, 30.9%, 32.7%, and 18.2%, respectively, of our patients. The reason for this lower rate of patients with multiple comorbidity is probably the lower age limit used by Steinau et al (>65 years).

Since mortality is now rare in thyroid surgery, the quality of the intervention is determined by the morbidity, especially the frequency of permanent recurrent laryngeal nerve paralysis and permanent hypocalcemia or hypoparathyroidism. The frequency of early postoperative complications in our patients was similar in the 2 age groups: 21.8% in patients younger than 75 years and 25.5% in the geriatric group. This rate of complications seems quite high, but fortunately only 13 (1.9%) of the younger and 2 (3.6%) of the geriatric patients had permanent complications. This difference between the age groups is not statistically significant but demonstrates a trend toward higher morbidity in the geriatric patients. Missing statistical significance, however, may represent a type II statistical error. Possible explanations for the higher rate of permanent complications in the geriatric patients are the significantly higher rate of reinterventions in this group (18.2% vs 6.7%; P=.006), the significantly higher frequency of large and often retrosternal nodular goiters (38.2% vs 3.1%; P<.001), and the higher incidence of malignancy (36.4% vs 26.2%; P=.17). These conditions are known to be associated with increased morbidity.

Considering the high rate of reinterventions in elderly patients and the associated higher rate of morbidity, we should discuss whether thyroid surgery in general should be more aggressive in the initial intervention, ie, total thyroidectomy for benign thyroid disease in case of bilateral nodular thyroid instead of selected removal of all nodular structures.

Despite the fact that 81.8% of the geriatric patients undergoing analysis presented with 1 or more accompanying disorders, internal postoperative complications (respiratory distress) developed in only 2. After adequate care in the ICU, both patients were able to leave the hospital with some delay. Mean postoperative hospital stay was 9.9 days compared with 15.7 days in the study by Steinau et al. Nevertheless, a mean (preoperative and postoperative) hospitalization of 14.2 days of the geriatric patients may seem extremely long compared with findings in North America. This discrepancy reflects the different medical care systems in the United States and Austria.

With increasing age, the incidence of poorly differentiated and undifferentiated (anaplastic) thyroid carcinomas is rising. Har-El et al found a rate of 30% of anaplastic thyroid carcinomas in patients older than 70 years compared with 7.4% in all age groups. In our patients, the incidence of undifferentiated thyroid carcinomas was also much higher in the geriatric patient group compared with younger patients (20.0% vs 3.9%; P=.006). In addition, the prognosis of differentiated thyroid carcinomas is worse in the elderly patient. This might be due to the higher prevalence of pathologic risk factors like vascular invasion, extracapsular extension, and follicular growth pattern in older patients. In our patients, this prognostic exacerbation begins at 45 years of age, whereas patients older than 75 years do not have a prognosis worse than that of patients aged 45 to 75 years.

CONCLUSIONS

Thyroid surgery in the geriatric patient can be performed with low morbidity that does not differ from that of younger patients. The guarantees for success are an individual risk-and-benefit analysis and a careful preoperative preparation (because of the high rate of concomitant diseases).

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Readership Poll Results

In a recent readership poll regarding the Generation Gap in Modern Surgery (March 2002 issue), our readers were advised that there was a definite decrease for 2001 in the NRMP match for categorical positions. They were asked to which factor this decrease could be attributed. The readers responded:

- Night call and in-hospital work hours, 22
- Lifestyle issues, 61
- Duration of training, 11
- Lack of flexibility in training programs, 8
- Other, 4%

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