

# Complications of thyroid surgery in octogenarians are more likely caused by comorbidities than by age alone

Mekel M, Stephen AE, Gaz RD, Perry ZH, Hodin RA, Parangi S. Thyroid surgery in octogenarians is associated with higher complication rates. *Surgery* 2009;146:913-21.

## SUMMARY

### BACKGROUND

The frequency of thyroid nodules increases throughout life. As a consequence, a large number of people 80 years of age or older have thyroid nodules; many of them undergo thyroid surgery. Some suggest that there is neither ample information concerning the efficacy of thyroid surgery nor adequate information regarding the surgical complications in elderly patients. The aim of this study was to determine whether the complication rates of thyroid surgery are higher than usual in people 80 years of age or older.

### METHODS

This is a retrospective study of the medical records of 3568 patients who had thyroid surgery at the Massachusetts General Hospital from July 2001 through October 2007. Patients selected for the study had a variety of surgical procedures, including excision of thyroid nodules, lobectomy, subtotal or near-total thyroidectomy, total thyroidectomy, and any other type of partial thyroidectomy. From this group, 90 patients 80 years of age or older (octogenarians) were selected for study. Also randomly selected from the 3568 patient records were 250 patients ages 18 through 79 years who comprised the control group. Excluded from this group were 8 patients, for whom major data were missing, leaving 242 patients in the control group. Data for analysis were obtained from preoperative and postoperative office records, electronic medical records, and anesthesia records. The following were collected as potential risk factors for the development of complications: patient age, sex, and preoperative diagnosis; presence of a substernal component of the thyroid;

previous thyroid surgery and the extent of surgery; body-mass index (BMI) and Coumadin use, and the American Society of Anesthesiologists (ASA) score and the Charlson comorbidity index. The ASA scores were divided into I, II, III, and higher.

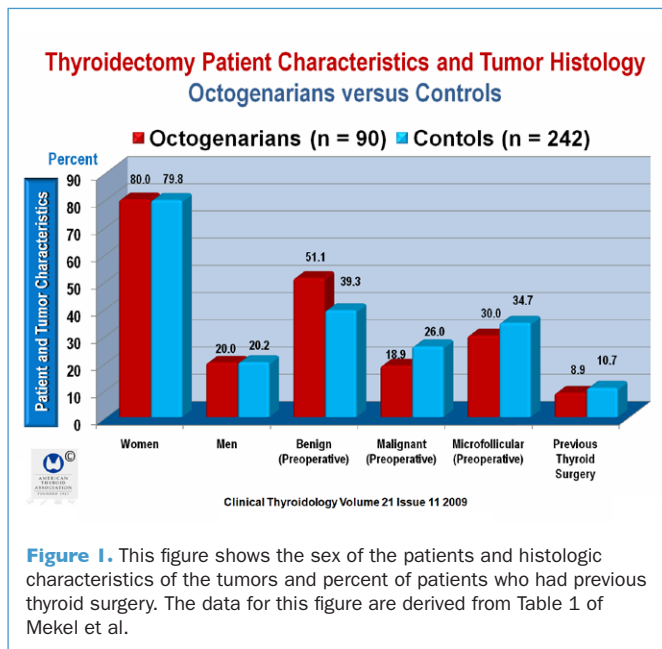
The indications for surgery were stratified into three categories: (1) presumed benign disease, (2) suspected or known malignant disease, and (3) microfollicular neoplasms. The final histopathology was also stratified into 3 categories: (1) benign, (2) significant malignancy (excluding incidentally found papillary microcarcinomas <1 cm), and (3) incidental papillary microcarcinoma.

The primary outcomes of interest were 30-day postoperative complications, including cardiovascular disease; respiratory, gastrointestinal, urologic, and central nervous system events such as stroke, metabolic and wound problems; and any other complications occurring within the 30-day time frame. Thyroid-specific complications such as hypoparathyroidism and vocal-cord dysfunction were based on the necessity of hospital readmission. Here and elsewhere in the text, percentages are reduced to an integer; in the figures the percentages are shown as reported.

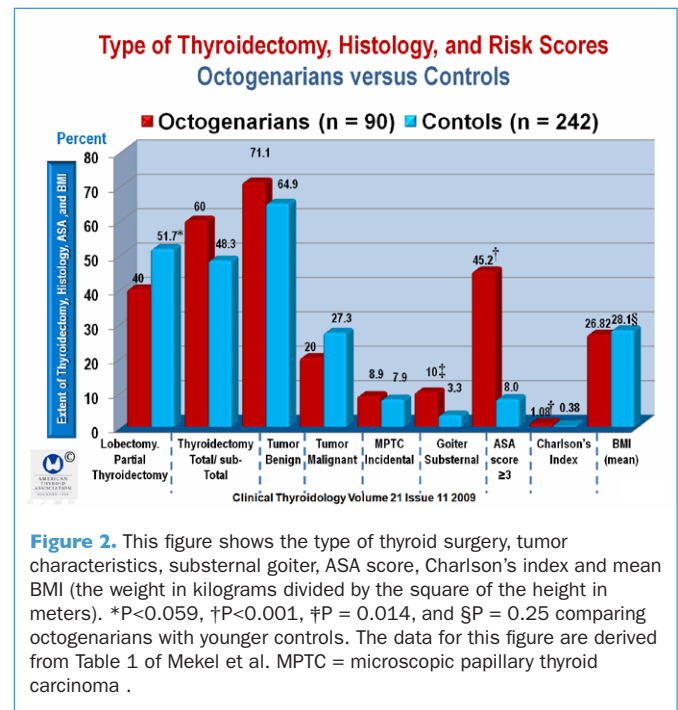
## RESULTS

### Demographics of Octogenarians and Control Groups (Figures 1 and 2)

A total of 90 octogenarians were included in the study group, all of whom had thyroid surgery, comprising 2.5% of the thyroid operations performed during the study period. The mean age of



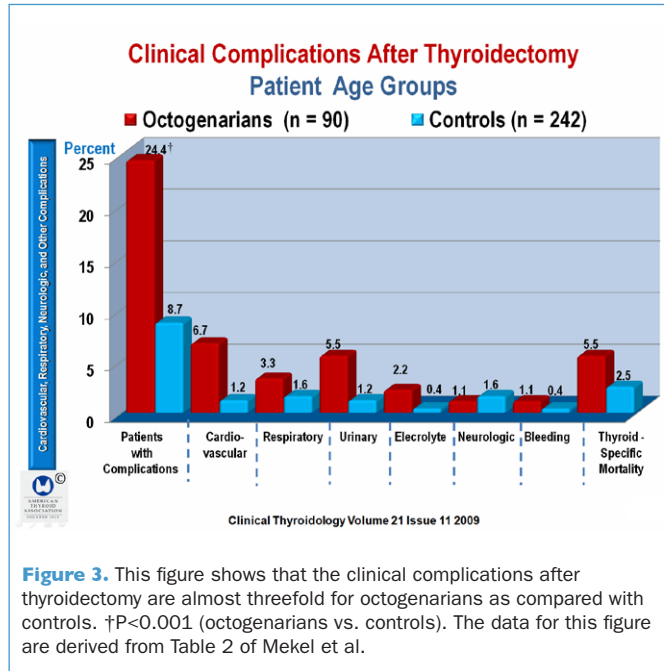
**Figure 1.** This figure shows the sex of the patients and histologic characteristics of the tumors and percent of patients who had previous thyroid surgery. The data for this figure are derived from Table 1 of Mekel et al.



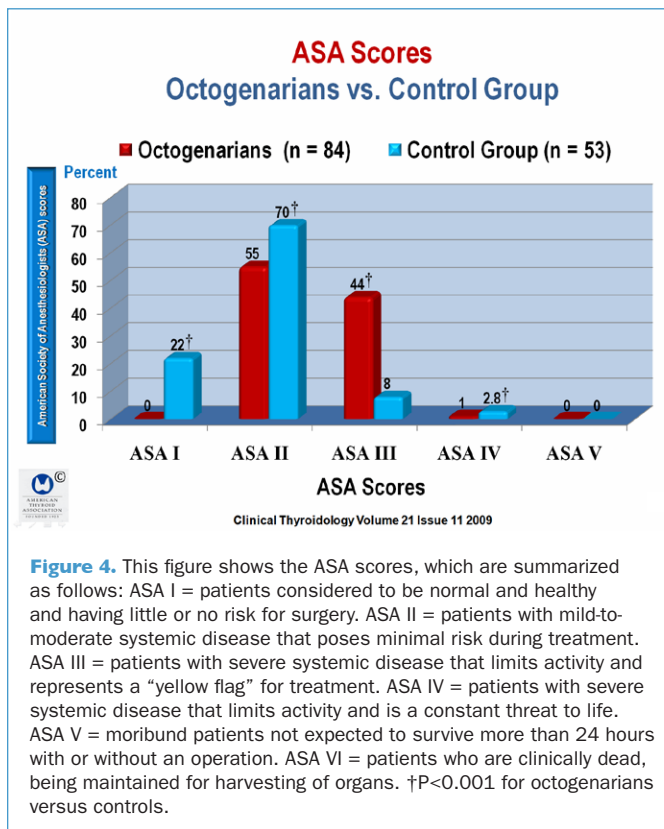
**Figure 2.** This figure shows the type of thyroid surgery, tumor characteristics, substernal goiter, ASA score, Charlson's index and mean BMI (the weight in kilograms divided by the square of the height in meters). \*P<0.059, †P<0.001, ‡P = 0.014, and §P = 0.25 comparing octogenarians with younger controls. The data for this figure are derived from Table 1 of Mekel et al. MPTC = microscopic papillary thyroid carcinoma.

octogenarians was 83.2 years (range, 80 to 94); 72 were women (80%) and 18 were men (20%) (Figure 1). Of the 242 patients in the control group, 193 were women (80%) and 49 were men (20%), with a mean age of 50.1 years (range, 18 to 79). There was no significant difference between the study and control groups in terms of sex, preoperative diagnosis, previous thyroid surgery, or final histopathology. Overall, there were 161 lobectomies or partial

thyroidectomies (40%) and 171 total or subtotal thyroidectomies (60%). More octogenarians had a substernal goiter as compared with the control group (10% vs. 3%,  $P = 0.014$ ). There were no significant differences in the mean BMI among octogenarians and controls. More octogenarians had total or subtotal thyroidectomy as compared with the control group; however, the difference was not statistically significant (Figure 2).



**Figure 3.** This figure shows that the clinical complications after thyroidectomy are almost threefold for octogenarians as compared with controls. <sup>†</sup> $P < 0.001$  (octogenarians vs. controls). The data for this figure are derived from Table 2 of Mekel et al.



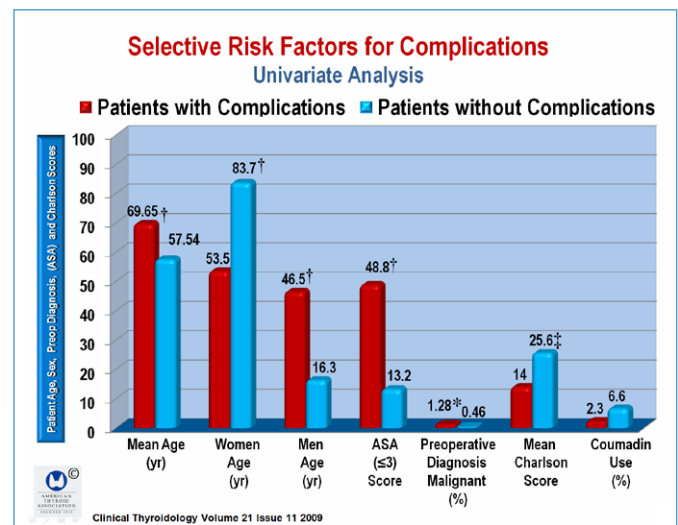
**Figure 4.** This figure shows the ASA scores, which are summarized as follows: ASA I = patients considered to be normal and healthy and having little or no risk for surgery. ASA II = patients with mild-to-moderate systemic disease that poses minimal risk during treatment. ASA III = patients with severe systemic disease that limits activity and represents a “yellow flag” for treatment. ASA IV = patients with severe systemic disease that limits activity and is a constant threat to life. ASA V = moribund patients not expected to survive more than 24 hours with or without an operation. ASA VI = patients who are clinically dead, being maintained for harvesting of organs. <sup>†</sup> $P < 0.001$  for octogenarians versus controls.

**Comorbidity and Charlson and ASA scores (Figures 2 and 3)**

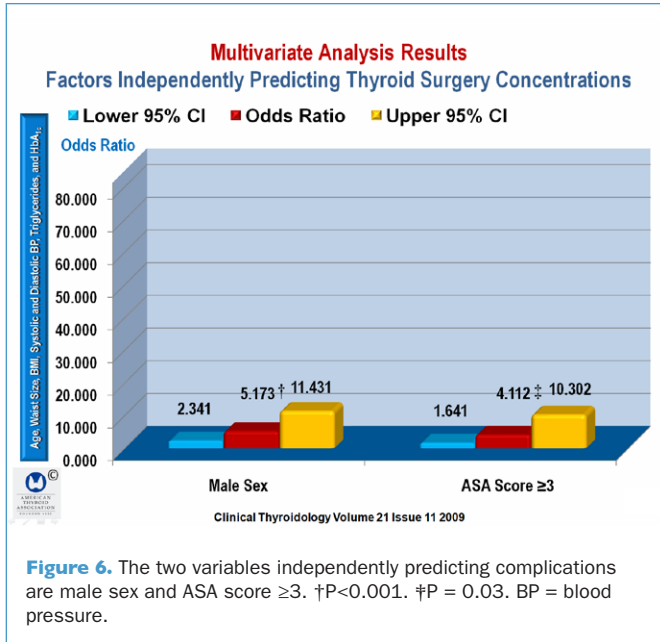
The Charlson index score was significantly higher (worse) in the octogenarians as compared with the control group. The mean ( $\pm$ SD) score was  $1.08 \pm 1.38$  (range, 0 to 6) versus  $0.38 \pm 0.89$  (range, 0 to 8) in octogenarians and controls ( $P < 0.001$ ) (Figure 2). In the octogenarian group, 45% had an ASA score  $\geq 3$  (45%) and a comorbidity index of 0; 37% had a score of 1 or 2. In the control group, 76% had a comorbidity index of 0, 22% had a score of 1 or 2, and only 8% had a score  $\geq 3$ . Cerebrovascular disease was the most prevalent comorbid condition in the octogenarians, 14% of whom had this at the time of surgery, and pulmonary disease was the most common comorbidity (12%) in the controls (Figure 3).

**The American Society of Anesthesiologists (ASA) scores (Figure 4)**

The ASA scores, which were available in 84 octogenarians (93%), were ASA I (0), ASA II (55%), ASA III (44%), ASA IV (1%), and ASA V (0%). ASA scores, which were available in 53 people in the control group (22%), were ASA I (22%), ASA II (70%), and ASA III (8%). The ASA scores were significantly higher in the octogenarians as compared with the control group ( $P < 0.001$ ) (Figure 4). The mean length of hospital stay for octogenarians was significantly longer than that for the control group:  $1.67 \pm 2.19$  days (range, 1 to 18) versus  $1.23 \pm 2.85$  days (range 1 to 43) ( $P < 0.01$ ). The overall complication rate was 13%; it was 24% in the octogenarians versus 9% in the younger group ( $P < 0.01$ ).



**Figure 5.** This figure shows the results of univariate analysis of selected risk factors that pose complications at the time of thyroid surgery. American Society of Anesthesiologists (ASA) score, Charlson’s index and mean BMI. \* $P < 0.203$ , <sup>†</sup> $P < 0.001$ , <sup>‡</sup> $P = 0.005$ , comparing octogenarians with younger controls. The data for this figure are derived from Table 4 of Mekel et al.



**Univariate and Multivariate Analyses (Figures 5 and 6)**

Univariate analysis found that age, male sex, ASA score ≥3, and the Charlson comorbidity index were significantly associated with postoperative complications after thyroidectomy (Figure 5). Multivariate analysis found that male sex independently increased the risk of complications after thyroid surgery by fivefold and an ASA score ≥3 increased the risk of complications fourfold. Age alone was found not to be an independent risk factor for complications after thyroid surgery (Figure 6).

**CONCLUSION**

Although an age of 80 years or older is associated with higher complication rates for thyroid surgery, this is independently related to other factors, such as underlying illnesses and male sex.

**COMMENTARY**

The study by Mekel and associates is one of the larger studies to address the complication rates of thyroid surgery in patients 80 years of age or older. The main conclusion of the study was that two independent risk factors predicted postoperative complications in the 30-day postoperative period under study—male sex and a high American Society of Anesthesiologists (ASA) risk score. Of considerable importance, advanced age was not an independent factor predicting postoperative complications. This is a key point that might be overlooked from the title of this article. It is important to separate the effects of age from the disorders that increase with age. It is the latter that predict postoperative complications, not patient age per se. The importance of this distinction is underscored by census studies indicating that there were approximately 5 million people 80 years of age or older in the United States in 2005, a number that is steadily rising. Obviously, the people in this group range from healthy to extremely ill, which impacts preoperative decisions, such as the decisions in this study.

Patients in the Mekel study had a variety of benign and malignant thyroid disorders that were treated by the authors, who are high-volume thyroid surgeons. There were some fairly large differences among the preoperative thyroid diagnoses in the two study groups: the thyroid disease was benign in approximately half the 90 octogenarians and in one-fourth of the 242 members of the control group 18 through 79 years of age, and approximately one-third of both groups had microfollicular lesions. Substernal goiter was found in 10% of the octogenarians and 3% of the younger control group, a difference that was statistically significant, and in some of the cases, clinically quite important. For example, an especially prolonged hospitalization occurred in an 83-year-old woman who had a sternotomy for a large substernal goiter complicated

with reintubation, tracheostomy, and sternal wound infection, requiring an 18-day hospitalization. The mean hospital stay was about the same: <2 days in both octogenarian and younger controls, with a range of 1 to 18 days in octogenarians and 1 to 43 days in controls. These diagnoses were not found to be independent variables affecting postoperative complications, yet as a practical matter, each thyroid diagnosis likely posed unique surgical challenges. Likewise, the list of comorbidities is long, including a large number of major health problems such as cardiovascular complications, stroke, congestive heart failure, arrhythmias, pneumonia, and acute renal failure, to mention a few. Each of these disorders predicts high postoperative complications as confirmed by the high ASA scores. Although the authors suggest that the octogenarians seemed to have a significantly greater comorbidity burden, as reflected by the mean Charlson index score—which was less predictive than the ASA score—the authors thus recommend that the ASA status should be part of the routine preoperative decision-making process. The authors also advise that more individualized strict criteria be applied before fine-needle aspiration biopsy (FNAB) is performed, suggesting that it may be delayed in octogenarians if the nodules are very small and of little clinical significance. They also suggest that performing FNAB on all clinically suspicious thyroid nodules and nodules >1 cm increases operations for benign disease that might be avoided. The current American Thyroid Association guidelines provide strong evidence that performing FNAB in multiple large nodules >1 cm is very likely to avoid missing a diagnosis of thyroid cancer unless there is ultrasound evidence that reliably indicates the nodule is benign.

Comorbidity is known to be an important contributory factor to poor outcomes in patients with thyroid cancer, especially in elderly patients. For example, a population-based observational study from the Netherlands (1) found that hypertension was the most frequent comorbidity with thyroid cancer (18%), followed by

other serious conditions such as cardiovascular diseases (6%) and diabetes mellitus (6%). The prevalence of hypertension was twice as high as expected in all age groups, yet comorbidity was not independently associated with overall survival up to 5 years, which might be insufficient follow-up to fully evaluate the effect of comorbidity.

Similar to the study by Mekel and associates, a study of 242 patients 70 years of age or older by Sanabria et al. (2) assessed the predictive effect of preoperative clinical factors on postoperative complications in patients undergoing head and neck surgery. Comorbidities were present preoperatively in almost 90% of patients, and approximately half had some type of local or systemic complication. Male sex, bilateral neck dissection, the presence of two or more comorbidities, reconstruction, and clinical stage IV tumors were significantly associated with postoperative complications. After analysis of risk factors, the authors concluded that it is possible to predict postoperative complications using preoperative clinical variables in older patients with head and neck tumors who had oncologic surgery.

A recently published study by Matsuyama and associates (3) that compared the clinical characteristics of thyroid cancers in 85 elderly patients 75 years of age or older, with those of 37 patients <30 years of age found that the elderly patients with papillary thyroid carcinoma had a significantly worse cumulative 5-year survival rate than that of the young patients with papillary thyroid carcinoma (92% vs. 100%, P = 0.03). Still, there was no significant difference in the survival rates of patients with low-risk tumors in the two age groups. Yet, with high-risk tumors the cumulative 2-year survival rate of elderly patients was significantly lower in patients not treated surgically than in

those treated surgically (80% vs. 100%, P = 0.02). The quality of life was severely impaired in 67% and 6% of the patients treated nonsurgically and surgically, respectively; demonstrating that surgery for thyroid cancer increases the survival rate and promotes the quality of life in elderly patients if they are well enough to tolerate the operation. In the Matsuyama study of elderly patients with recurrent papillary thyroid carcinoma, there were no statistically significant differences in survival among patients with locoregional metastases when patients had metastases found on the initial surgery or were secondarily identified as locoregional recurrences later in the course of follow-up. Although outcome tended to be worse in patients undergoing a second surgery for recurrent metastases, the difference was not statistically significant as compared with patients who had metastases at the time of initial surgery.

The Mekel study found that men had a significantly higher complication rate than women. Why this is so is not entirely clear. However, it is well recognized that men use the health system differently than women do, seeking medical attention later than women and presenting with more advanced disease.

The conclusion is that patients 80 years of age or older have a higher complication rate with thyroid surgery that is more closely related to comorbidities than to age per se. Mekel and associates recommend providing more stringent preoperative evaluation using ASA scores and caution in prescribing therapy before it is clear that thyroid surgery is the most effective means of treating elderly patients after counseling the patient and their families concerning expectations and risk.

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**References**

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[www.thyroid.org/patients/ct/index.html](http://www.thyroid.org/patients/ct/index.html)