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## **Feasibility criteria for total thyroidectomy in outpatient surgery** **Critères de faisabilité d'une thyroïdectomie totale en chirurgie ambulatoire**

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## 1 Abstract

2 **Introduction:** France is pursuing a policy of cutting healthcare costs, and outpatient surgery is one  
3 of the objectives of this policy. Thyroid surgery could be suitable for outpatient management,  
4 provided there is an appropriate patient selection process. The aim of this study was to assess the  
5 risk factors for postoperative complications in total thyroidectomy (TT).

6 **Design:** A single-center observational study was carried out from January 2010 to December 2015.

7 **Method:** Correlations between, on the one hand, age, gender, obesity, history of surgery,  
8 antiplatelet and/or anticoagulation treatment, the surgeon's experience, surgery time, repeated  
9 lymph node dissection, and surgical indication (cancer, lymphocytic thyroiditis, Graves' disease or  
10 multinodular goiter) and, on the other hand, onset of postoperative complications (postoperative  
11 hypocalcemia, uni- or bi-lateral lesions of the recurrent laryngeal nerves, and premature  
12 compressive hematoma) were assessed.

13 **Results:** 424 consecutive TTs were included. 85 patients showed postoperative hypocalcemia  
14 (20.04%), 18 recurrent laryngeal nerve lesion (4.25%), and 4 compressive cervical hematoma  
15 (0.94%). Overall morbidity was 24.06%. Risk factors identified for postoperative hypocalcemia  
16 comprised: female gender [OR=3.2584; 95%CI (1.5500-7.7515); P=0.0036], surgery time  
17 [OR=1.0095; 95%CI (1.0020-1.0172); P=0.0129], and surgical indication for benign adenoma  
18 [OR=5.0642; 95%CI (1.7768-14.5904); P=0.0022]. None of the study variables emerged as risk  
19 factors for recurrent laryngeal nerve lesion. Repeated dissection increased the risk of re-do surgery  
20 for compressive hematoma [OR=25.1373; 95%CI (0.8468-32.2042); P=0.0347].

21 **Conclusion:** Surgery time, female gender, repeated dissection and total thyroidectomy for benign  
22 adenoma are risk factors that should be considered in decision-making for performing TT on an  
23 outpatient basis.

## 24 Résumé

25 **Introduction :** La politique de santé en France vise à diminuer le coût des soins, et la chirurgie  
26 ambulatoire fait partie des objectifs. La chirurgie thyroïdienne serait adaptable aux soins  
27 ambulatoires à condition qu'il existe au préalable un processus de sélection adapté des patients. Le  
28 but de cette étude était d'évaluer les facteurs de risque de complications post-opératoires lors d'une  
29 thyroïdectomie totale (TT).

30 **Modèle :** Une étude monocentrique observationnelle a été menée de janvier 2010 à  
31 décembre 2015.

32 **Méthode :** Les corrélations entre, d'une part, l'âge, le sexe, l'obésité, les antécédents chirurgicaux,  
33 la prise d'antiagrégants plaquettaires et/ou de traitement anticoagulant, l'expérience du chirurgien, la  
34 durée de l'intervention, l'évidement ganglionnaire répété, les indications chirurgicales (cancer,  
35 thyroïdite chronique lymphocytaire, maladie de Basedow ou goitre multinodulaire) et, d'autre part,  
36 l'apparition de complications post-opératoires (hypocalcémie post-opératoire, lésions unilatérales ou  
37 bilatérales des nerfs laryngés récurrents ou hématome compressif prématuré) ont été estimées.

38 **Résultats :** 424 TT consécutives ont été incluses dans l'étude. Quatre-vingt-cinq patients ont  
39 présenté une hypocalcémie post-opératoire (20,04 %), 18 patients ont présenté une lésion des nerfs  
40 laryngés récurrents (4,25 %) et 4 patients ont présenté un hématome cervical compressif (0,94 %).  
41 Le taux de morbidité global était de 24,06 %. Les facteurs de risque identifiés pour l'hypocalcémie  
42 post-opératoire étaient le sexe féminin [OR = 3,2584 ; IC 95 % (1,5500-7,7515) ; p = 0,0036], la  
43 durée opératoire [OR = 1,0095 ; IC 95 % (1,0020-1,0172) ; p = 0,0129] et l'indication chirurgicale  
44 pour adénome bénin [OR = 5,0642 ; IC 95 % (1,7768-14,5904) ; p = 0,0022]. Aucune des variables  
45 de l'étude n'est apparue comme un facteur de risque d'une lésion des nerfs laryngés récurrents.  
46 L'évidement ganglionnaire répété augmente le risque d'une révision chirurgicale pour hématome  
47 compressif [OR = 25,1373 ; IC 95 % (0,8468-32,2042) ; p = 0,0347].  
48

49 **Conclusion** : La durée de l'intervention, le sexe féminin, l'évidement ganglionnaire répété et une  
50 thyroïdectomie totale pour un adénome bénin sont des facteurs de risque à prendre en  
51 considération lors de la prise de décision d'une TT en ambulatoire.

52

53 **Keywords:** outpatient; risk factors; surgery; thyroid

54 **Mots clés** : ambulatoire ; chirurgie ; facteurs de risque ; thyroïde

55

56

57

## 58 **I. INTRODUCTION**

59

60 In light of budgetary requirements imposed on healthcare institutions, developing  
61 outpatient surgery is a universal necessity. France is still lagging behind in the  
62 development of this type of surgery compared with other OECD (Organisation for  
63 Economic Cooperation and Development) countries. To reduce this gap, a multiannual  
64 national programme was launched in 2010 by the French Ministry for Health together  
65 with Regional Health Agencies (*ARS, Agences Régionales de Santé*), led by the  
66 Directorate General for Healthcare Provision (*DGOS, Direction Générale de l'Offre de*  
67 *Soin*), to help set a target higher than 50% for outpatient surgery by 2016 [1]. In  
68 2014, outpatient surgery amounted to 44.9% of all surgeries, compared with 37.7% in  
69 2012 [2].

70

71 According to the analysis of data from the Medical Information Systems Program (*PMSI,*  
72 *Programme de médicalisation des systèmes d'information*), 35,367 thyroidectomies  
73 were performed in France in 2010, resulting in a cost of several tens of millions of  
74 euros reimbursed by national insurance (including 37 million euros to reimburse boxes  
75 of levothyroxine and 2.4 million euros for those signed off from work) [3]. One of the  
76 potential solutions to decrease these costs is to decrease average length of stay in  
77 hospital and to consider eventually introducing outpatient thyroid surgery.

78

79 Indeed, total thyroidectomy is a surgical procedure that is suitable for outpatient  
80 treatment. The procedure is not very painful, causes little bleeding, is not very  
81 aggressive from a physiological point of view, is reliable, and does not last long.  
82 However, it creates risks of severe complications that could lead to patient death

83 through acute respiratory distress syndrome or irreversible cerebral anoxia in the event  
84 of compressive cervical haematoma without emergency evacuation. Furthermore, other  
85 non-lethal complications for patients may occur (symptomatic hypocalcaemia or  
86 recurrent nerve lesions).

87  
88 The aim of this study was therefore to establish risk factors for postoperative  
89 complications of total thyroidectomy.

90

91

## 92 **II. SUBJECTS AND METHOD**

93

### 94 1- Population and study's design

95

96 This work is an observational and descriptive study involving patients of the Angers  
97 University Hospital (*Centre Hospitalier Universitaire d'Angers*).

98 All the adult patients who underwent a total thyroidectomy in our centre between  
99 January 2010 and December 2015 were consecutively included in the study.

100 Patients who underwent an isthmolobectomy, any other partial thyroidectomy  
101 (including completion thyroidectomy), or parathyroid surgery were excluded. Patients  
102 who had a surgical indication for additional dissection (central neck dissection and/or  
103 dissection of the deep cervical lymph chain) were also excluded.

104

105 Patient data were collected prospectively by the medical team during patient  
106 hospitalisation in our centre using a standard questionnaire and were subsequently  
107 entered into a database.

108 The database was included in the register of the French data protection authority  
109 (CNIL, *Commission Nationale de l'Informatique et des Libertés*) to safeguard the  
110 personal data of patients.

111

### 112 2- Variables studied

113

114 The different complications studied included: recurrent nerve lesions, immediate  
115 postoperative hypoparathyroidism, and the occurrence of postoperative bleeding. They  
116 were defined, respectively, by: the presence of bilateral or unilateral paralysis of the  
117 vocal cords linked to postoperative dysphonia and shown using nasofibroscopy  
118 performed by a specialised physician on D1; symptomatic ( $2.00 \text{ mmol/L} < \text{Ca}^{++} <$   
119  $2.20 \text{ mmol/L}$ ) or asymptomatic ( $\text{Ca}^{++} < 2.00 \text{ mmol/L}$ ) hypocalcaemia in the first 3  
120 postoperative days requiring calcium plus vitamin D supplementation; and the  
121 formation of a haematoma in the thyroid bed requiring further surgery in the operating  
122 room.

123 Calcium plus vitamin D supplementation could be administered in various ways:  
124 calcium intravenous injection, calcium per os, and alfacalcidol per os, either alone or in  
125 combination with calcium per os.

126 The nasofibroscopy was not routinely performed; it was only done in case of  
127 postoperative dysphonia.

128

129 The variables studied as potential risk factors were: age, sex (male or female), obesity  
130 ( $\text{BMI} > 30$ ), the surgeon's experience (number of total thyroidectomies performed during  
131 career), antiplatelet and/or anticoagulation treatment, surgery duration (in minutes),  
132 recurrent dissection, an operated thyroid disorder, intraoperative search for recurrent  
133 nerves, and past surgery and/or cervical radiation therapy.

134 The anatomopathological analysis of the sample following surgical excision determined  
135 the disorder operated on (multinodular goitre (MNG), Graves' disease, lymphocytic  
136 thyroiditis, benign adenoma, cancer).

137

138 The study's primary endpoint was the appearance of a recurrent nerve lesions, the  
139 need for postoperative calcium plus vitamin D supplementation, and/or further surgery  
140 for haematoma.

141

### 142 3- Surgical techniques

143

144 Trained surgeons performed the thyroidectomies, via anterior cervicotomy only.

145 Classic dissection techniques were used. Haemostasis techniques included ligatures;  
146 vascular clips; sutures; monopolar, bipolar, or ultrasonic electrocoagulation; or a  
147 combination of several techniques.

148 When the preoperative assessment recommended it, recurrent lymph node dissection  
149 was performed during the same surgery.

150 Drainage of the thyroid bed was not done systematically and was left to the surgeon's  
151 discretion based on intraoperative observations.

152 None of the surgeries were performed using neurostimulation of the recurrent laryngeal  
153 nerves.

154

#### 155 4- Statistical analysis

156

157 Data were described in a conventional way in the descriptive analysis, as mean  $\pm$   
158 standard deviation for Gaussian quantitative variables and as median (95CI) for the  
159 other quantitative variables, and as n (%) for qualitative variables.

160 As part of the descriptive analysis, Fisher's exact test, Student's t-test or the Mann-  
161 Witney U test were performed, depending on the context.

162 We also performed multivariate logistic regressions to explain our binary variables. A  
163 manual backward selection was performed for the selection of explanatory variables to  
164 be included in the model. The variables age, sex, obesity (BMI>30) and surgery  
165 duration were forced into each model. The odds ratio (OR) derived from the logistic  
166 regression are presented with the 95% confidence intervals (95CI).

167 Statistical analysis was performed using R Statistical Software.

168

169

### 170 **III. RESULTS**

171

#### 172 1- Population characteristics

173

174 Four hundred and twenty-four patients who underwent total thyroidectomy between  
175 January 2010 and December 2015 were included in our study.

176 The population flow diagram can be seen in Figure 1.

177 The median age of our cohort was 51 years [95CI (49.5-52.5)] and most patients were  
178 female (77.65%).

179 All the demographic and clinical characteristics of the population are summarised in  
180 Table 1.

181  
182 Eighty-five patients (20.04%) presented **symptomatic and/or substituted**  
183 **hypocalcaemia** and required calcium plus vitamin D supplementation, 18 patients  
184 (4.25%) presented a recurrent lesion shown by nasofibroscopy, and 4 patients (0.94%)  
185 required reoperation for compressive haematoma.

186 The overall premature morbidity observed in our study was 24.06%.

187  
188 The distribution of complications in univariate analysis is summarised in Table 2.

189

## 190 **2- Postoperative hypocalcaemia**

191

192 In multivariate analysis, female patients were more likely to present **symptomatic**  
193 **and/or substituted hypocalcaemia** [OR=3.2584 95CI(1.5500-7.7515),  $p=0.0036$ ].  
194 Furthermore, the longer the surgery duration, the higher the risk of **postoperative**  
195 **hypocalcaemia** [OR=1.0095 95CI(1.0020-1.0172),  $p=0.0129$ ]. Finally, the final  
196 diagnosis was also linked to the likelihood of receiving calcium plus vitamin D  
197 supplementation. Indeed, patients who were diagnosed with MNG, Graves' disease,  
198 lymphocytic thyroiditis or cancer were all less likely to develop a **postoperative**  
199 **hypocalcaemia** than those who were diagnosed with a benign adenoma [OR=5.0642  
200 95CI(1.7768-14.5904),  $p=0.0022$ ]. All the results are summarised in Table 3.

201

202 An analysis of the benign adenoma sub-group was performed to try to determine  
203 whether the size of the adenoma could explain the result's significance. Assuming a  
204 non-normal distribution, a Mann-Witney U test was performed to compare medians.  
205 There is no significant difference in the medians of adenoma sizes in the groups "with  
206 hypocalcaemia" and "without hypocalcaemia". Results are presented in Table 4.

207

208 3- Recurrent laryngeal nerve lesions

209

210 No independent risk factor was found in multivariate analysis. Results are presented in  
211 Table 5.

212

213 4- Compressive haematoma

214

215 One variable stands out in multivariate analysis. Patients having undergone recurrent  
216 lymph node dissection were more likely to require further surgery for compressive  
217 haematoma compared with patients who did not [OR=25.1373 95CI(0.8468-32.2042),  
218  $p=0.0347$ ]. Results are presented in Table 6.

219

220

#### 221 **IV. DISCUSSION**

222

223 Patients principally undergo total thyroidectomies for multinodular goiter (with or  
224 without thyroid dysfunction) or Grave's disease for which only total thyroidectomy is  
225 recommended [4]. It remains a high-risk surgery. Although decreasing, its morbidity  
226 rate (20% to 30% all complications combined) [5] makes surgeons reluctant to  
227 perform the procedure on an outpatient basis. In an American study, Charles T. Tuggle  
228 *at al.* showed that even in specialised centres with many patients, outpatient  
229 procedures remain rare and are performed on a small number of carefully selected  
230 patients [6].

231

232 Several learned institutions have published recommendations relating to outpatient  
233 management of total thyroidectomies (TT). The American Thyroid Association indicates  
234 that the surgery can be performed on an outpatient basis for carefully selected patients  
235 and insists on informing the latter about the potential risks, but does not recommend  
236 outpatient treatment [7]. In 2013, the French Association of Endocrine Surgery (AFCE,  
237 *Association Francophone de Chirurgie Endocrinienne*) made recommendations to that  
238 effect (grade C) [5], recommending 24-hour hospitalisation (1 night) for TT patients.

239 The association also indicated that the surgery could be performed on an outpatient  
240 basis in the case of carefully selected, well-informed patients and insisted on the  
241 surgeon's responsibility in making this decision.

242

243 There are many relative contraindications (CIs) and exclusion criteria for TT on an  
244 outpatient basis, including those relating to the patient and his or her disorder as well  
245 as a number of psychological and social factors: [5] [8-15]

- 246 - Obesity (BMI > 30kg/m<sup>2</sup>),
- 247 - Antiplatelet and/or anticoagulation treatment,
- 248 - Age over 50 years,
- 249 - Certain thyroid disorders (lateral dissection for suspicion of lymph node  
250 metastases, Graves' disease, extensive resection for a locally advanced  
251 malignant disorder, iterative surgery),
- 252 - The surgeon's lack of experience,
- 253 - Male gender,
- 254 - A plunging goitre or excision volume > 80mL
- 255 - Lack of sufficient knowledge of the language,
- 256 - The patient's lack of motivation.

257

258 Several studies have suggested that some of these contraindications could be lifted.  
259 They argue, for example, that anticoagulation treatment (and antiplatelet treatment) is  
260 not a contraindication as long as the haemostasis is performed carefully [16].  
261 Furthermore, being aged over 50 years seems to be protective factor against  
262 postoperative hypocalcaemia [17], while J.B. Finel *et al.* have shown that a BMI over 25  
263 does not seem to be a risk factor for postoperative complications [18].

264

265 There is a lack of consensus relating to the treatment of postoperative hypocalcaemia  
266 and its incidence varies depending on the definition it is given. It is temporary in 20 to  
267 30% of cases, and permanent in 1 to 4% of cases [19]. In our study, patients with  
268 minor and symptomatic postoperative hypocalcaemia (calcaemia corrected between 2  
269 and 2.20 mmol/L), as well as those with major hypocalcaemia with or without clinical

270 signs (calcaemia corrected < 2 mmol/L), received calcium plus vitamin D  
271 supplementation. The **postoperative hypocalcaemia** rate was 20.04%. We were able to  
272 demonstrate that female gender was an independent risk factor for postoperative  
273 hypoparathyroidism, which confirms the results of the study by Duclos *et al.* (BMJ,  
274 2012) [20]. The same is true for surgery duration: the longer it is, the higher the risk  
275 of postoperative hypocalcaemia. Surgery duration can be linked to the surgeon's  
276 experience. Indeed, a trained surgeon decreases the risk of parathyroid gland lesions,  
277 while 5 to 19 years of experience guarantees the lowest complication rate [20].  
278 Surprisingly, our study showed that patients who underwent surgery for benign  
279 adenoma were more at risk of developing postoperative hypocalcaemia than patients  
280 who underwent surgery for MNG, cancer, lymphocytic thyroiditis or Graves' disease.  
281 The size of the adenoma did not seem to explain this phenomenon (Table 4). After  
282 rereading anatomopathological reports of total thyroidectomy samples, we were able to  
283 demonstrate a higher incidence of incidental parathyroidectomies (IP) in the group of  
284 patients who underwent surgery for a benign adenoma and who presented  
285 postoperative hypocalcaemia. This most likely explains our results, especially knowing  
286 that IPs are significantly linked to a higher risk of symptomatic hypocalcaemia 2 weeks  
287 after the surgery, as well as the risk of premature postoperative biochemical  
288 hypocalcaemia [21].

289 There is a lack of consensus on the ways to predict the occurrence of postoperative  
290 hypoparathyroidism despite the fact that many studies have already addressed the  
291 topic by trying to determine whether the calcium or PTH rate could be a predictive  
292 marker. Notably, Nahas *et al.* were able to show that an increased calcium levels  
293 between the 6<sup>th</sup> and 12<sup>th</sup> hour following surgery had a 100% positive value for  
294 predicting a return to normal calcium levels [22]. Nevertheless, with PTH reaching its  
295 lowest level at the 3<sup>rd</sup> postoperative hour (contrarily to the calcium rate, which is at its  
296 lowest on the 3<sup>rd</sup> day), it seems to be a more effective marker within the framework of  
297 outpatient treatment [23]. More so than the PTH rate, its decrease seems to provide a  
298 strong argument for postoperative hypocalcaemia. According to a meta-analysis  
299 performed in 2007 by Noordzij *et al.*, if the PTH rate decreases by 65% compared with  
300 its basal rate in the 6<sup>th</sup> postoperative hour, it is predictive of hypocalcaemia with

301 Se = 96.4% and Sp = 91.4% [24]. A routine PTH assay in all centres performing total  
302 thyroidectomies therefore seems beneficial for the treatment of patients on an  
303 outpatient basis.

304

305 Recurrent paralysis contributes to thyroid surgery morbidity and to a deterioration of  
306 the patient's quality of life. According to a meta-analysis involving 27 studies, published  
307 in 2009, recurrent paralysis affects 9.8% of patients on average when it is temporary  
308 and 2.3% of patients on average when it is permanent [25]. In our study, 18 patients  
309 were affected by postoperative dysphonia, which revealed vocal cord paralysis  
310 (4.25%). A single case of bilateral paralysis (Table 1) in abduction was observed, but it  
311 was not life-threatening for the patient and was treated by vocal cord medialisation  
312 through reinjection of autologous fat, following the failure of speech and language  
313 therapy. We did not find any independent risk factors or protective factors during our  
314 study. We were able to determine that visualising the recurrent nerve is not a risk  
315 factor for recurrent nerve lesions. In fact, this is in line with recommendations, which  
316 call for the need to visualise systematically, during surgery, the 2 recurrent nerves  
317 [26]. Hermann *et al.* have shown that visualising the recurrent nerve reduces the risk  
318 of intraoperative damage by 50% [27].

319

320 Compressive haematoma remains the complication most feared by surgeons because it  
321 is potentially life-threatening if emergency evacuation cannot be performed. However,  
322 it is also rare, with an estimated rate between 0.2 and 2.7% [28]. The first warning  
323 sign is acute dyspnoea. Our study found a 0.94% rate of compressive haematoma that  
324 required surgical evacuation in the operating room, without any association with excess  
325 mortality. Despite the small number of haemorrhages found in our study, we were able  
326 to demonstrate that recurrent dissection was an independent risk factor of compressive  
327 haematoma. To the best of our knowledge, this is an unprecedented result. Other risk  
328 factors were found, such as pre-existing dyspnoea at the time of surgery and male  
329 gender in a retrospective study on a series of 6,830 patients with 70 compressive  
330 haematomas [29], as well as an advanced age of the patient and the surgeon's lack of  
331 experience [30]. In our study, drainage of the thyroid bed was left to the surgeon's

332 discretion based on intraoperative observations, and it is therefore not included in the  
333 final results. However, it does not seem to be a protective factor for haemorrhages and  
334 seems rather to increase the risk of infection [31]. Moreover, a meta-analysis of the  
335 Cochrane Library has shown its futility in routine thyroidectomies [32].

336

337 There are several limitations to this study. First of all, our rate of recurrent nerve  
338 paralysis may be underestimated. Indeed, we did not perform a nasofibroscopy  
339 systematically but only in case of dysphonia. Thus some of the paralysies which were  
340 not associated with postoperative dysphonia were not taken into account. Secondly,  
341 although our data were collected prospectively, we did not show the rate of definitive  
342 hypocalcaemia. Our goal was to assess criteria for outpatient management for total  
343 thyroidectomy and the rate of immediate postoperative hypocalcaemia seemed more  
344 appropriate in such a decision. Some authors consider definitive hypocalcaemia as the  
345 only true complication of total thyroidectomy, but immediate postoperative  
346 hypocalcaemia, even transient, may compromise outpatient thyroidectomy according to  
347 its severity.

348

349 In regard of surgery's evolution and the way in which it is approached by the health  
350 authorities, outpatient surgery will more and more prevail for physicians. As clinicians,  
351 it will be our responsibility to decide which actions are eligible for such management,  
352 and if thyroidectomies are to find their place in it, this would not be done without  
353 careful attention to the selection of patients and the implementation of validated and  
354 consensual protocols to allow an acceptable surgery with minimal risk for patients.

355 According to our study, surgery duration, female gender, recurrent dissection, and  
356 benign adenoma seem to be factors that should be considered when making decisions  
357 regarding the potential performance of a total thyroidectomy on an outpatient basis.

358

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360

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363

364

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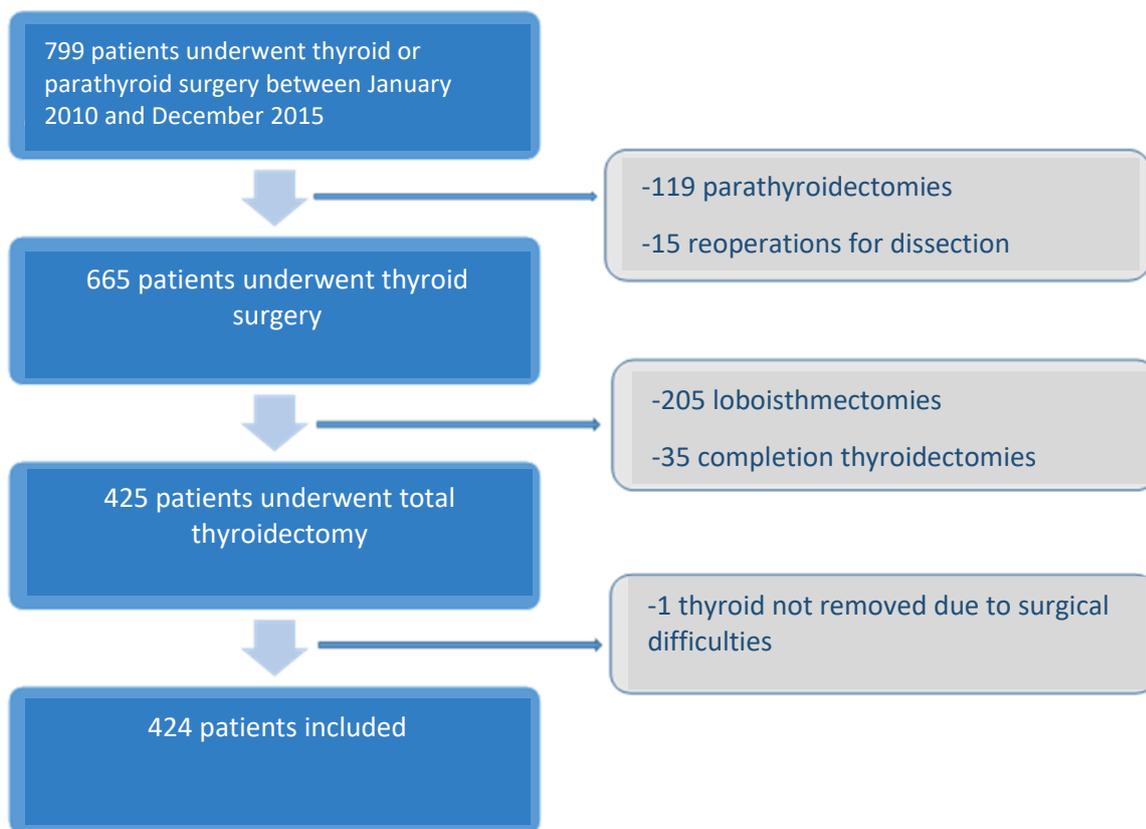
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**Figure 1. Population flow diagram**



**Table 1. Demographic and clinical characteristics of the 424 patients included, Department of Digestive and Endocrine Surgery, Angers University Hospital**

	<b>Patients n=424 (%)</b>
<b>Age, years (median)</b>	51
95%CI	49.5-52.5
<b>Sex</b>	
Male	94 (22.17)
Female	330 (77.83)
<b>Body Mass Index (BMI)</b>	
<30	302 (71.23)
>30	122 (28.77)
<b>Past surgery or cervical radiation therapy</b>	11 (2.59)
<b>Antiplatelet and/or anticoagulation treatment</b>	44 (10.38)
<b>Surgeon's experience (total number of thyroidectomies performed)</b>	
<100	43 (10.14)
100-200	98 (23.11)
>200	283 (66.75)
<b>Surgery duration, minutes (median)</b>	90
95%CI	90-90
<b>Recurrent lymph node dissection</b>	27 (6.38)
<b>Recurrent nerves seen</b>	371 (87.50)
<b>Average length of stay, days</b>	2.4
<b>Diagnoses</b>	
Multinodular goitre (MNG)	223 (52.60)
Graves' disease	37 (8.73)
Lymphocytic thyroiditis	48 (11.32)
Benign adenoma	18 (4.25)
Cancer	98 (23.00)
<b>Postoperative hypocalcaemia</b>	85 (20.04)
<b>Recurrent laryngeal nerve lesions</b>	18 (4.25)
Right	4 (22.22)
Left	13 (72.22)
Bilateral	1 (5.56)
<b>Reoperation for haematoma</b>	4 (0.94)
<b>Overall morbidity</b>	102 (24.06)

	<b>Symptomatic and/or subsituted hypocalcaemia</b>		<i>p</i>	<b>Recurrent paralysis</b>		<i>p</i>	<b>Compressive haematoma</b>		<i>p</i>	<b>Overall morbidity</b>		<i>p</i>
	Yes N=85	No N=339		Yes N=18	No N=406		Yes N=4	No N=420		Yes N=102	No N=322	
<b>Sex</b>			<b>0.001**</b>			0.774			0.214			<b>0.004**</b>
M	8	86		3	91		2	92		12	82	
F	77	253		15	315		2	328		90	240	
<b>Obesity (BMI&gt;30)</b>			0.083			0.134			0.326			0.555
No	67	235		10	292		2	300		75	227	
Yes	18	67		8	114		2	120		27	95	
<b>Past surgery and/or cervical radiation therapy</b>			0.701			1			1			0.472
No	84	329		18	395		4	409		101	312	
Yes	1	10		0	11		0	11		1	10	
<b>Antiplatelet and/or anticoagulation treatment</b>			0.744			0.708			0.356			0.827
No	77	303		17	363		3	377		92	288	
Yes	8	36		1	43		1	43		10	34	
<b>Surgical experience</b>			0.103			0.223			0.257			0.219
<100 TT	7	36		4	39		1	42		10	33	
100-200 TT	27	71		3	95		0	98		30	68	
>200 TT	51	232		11	272		3	280		62	221	
<b>Recurrent lymph node dissection</b>			0.198			0.618			0.232			0.244
No	77	320		18	379		3	394		93	304	
Yes	8	19		0	27		1	26		9	18	
<b>Recurrent nerves seen</b>			<b>0.039*</b>			0.146			1			<b>0.007**</b>
No	5	48		0	53		0	53		5	48	
Yes	80	291		18	353		4	367		97	274	
<b>Final diagnosis</b>			<b>0.023*</b>			0.050			0.613			<b>0.010*</b>
MNG	39	184		9	214		2	221		46	177	
Graves' disease	10	27		4	33		1	36		14	23	
Thyroiditis	10	38		4	44		0	48		14	34	
Benign adenoma	9	9		0	18		0	18		9	9	
Cancer	17	81		1	97		1	97		19	79	

**Table 2. Distribution of complications. Descriptive analysis (Fisher's exact test)**

\*  $p < 0.05$ ; \*\*  $p < 0.01$ ; \*\*\*  $p < 0.001$ . *p*-value significant (i.e.,  $< 0.05$ ) indicated in bold.

TT: total thyroidectomies

**Table 3. Risk factors for postoperative hypocalcaemia. Multivariate analysis.**

	<b>Postoperative hypocalcaemia</b>	
	<b>OR (95%IC)</b>	<b>p</b>
<b>Female gender</b>	3.2584 (1.5500-7.7515)	<b>0.0036 **</b>
<b>Age</b>	0.990.9 (0.9729-1.0090)	0.3210
<b>Obesity (BMI&gt;30)</b>	0.05593 (0.2978-1.0044)	0.0597
<b>Surgery duration</b>	1.0095 (1.0020-1.0172)	<b>0.0129 *</b>
<b>Benign adenoma</b>	5.0642 (1.7768-14.5904)	<b>0.0022 **</b>

\*  $p < 0.05$ ; \*\*  $p < 0.01$ ; \*\*\*  $p < 0.001$ .  $p$ -value significant (i.e.,  $< .05$ ) indicated in bold.

**Table 4. Size of benign adenomas. Comparison of medians. Mann-Witney U test.**

	<b>Benign adenoma with postoperative hypocalcaemia n=9 (50%)</b>	<b>Benign adenoma without hypocalcaemia n=9 (50%)</b>	<b><i>P value</i></b>
<b>Adenoma size in cm (median)</b>	1.7	2.5	0.9283

**Table 5. Risk factors for recurrent laryngeal nerve lesions. Multivariate analysis.**

	<b>Recurrent paralysis</b>	
	<b>OR (95%IC)</b>	<b>P value</b>
<b>Female gender</b>	1.9424 (0.5899-8.8674)	0.3215
<b>Age</b>	0.9947 (0.9610-1.0298)	0.7630
<b>Obesity (BMI&gt;30)</b>	1.9538 (0.7072-5.2196)	0.1823
<b>Surgery duration</b>	1.0107 (0.9962-1.0240)	0.1208
<b>Surgical experience (100 to 200 TT)</b>	0.2283 (0.0390-1.1613)	0.0766
<b>Surgical experience (&gt;200 TT)</b>	0.4875 (0.1491-1.9100)	0.2584

*TT : total thyroidectomies*

**Table 6. Risk factors for compressive haematoma. Multivariate analysis.**

	<b>Compressive haematoma</b>	
	<b>OR (95%IC)</b>	<b>p</b>
<b>Female gender</b>	0.1977 (0.0184-1.9888)	<i>0.1502</i>
<b>Age</b>	0.9689 (0.8998-1.0446)	<i>0.3903</i>
<b>Obesity (BMI&gt;30)</b>	2.6408 (0.2865-6.5611)	<i>0.3569</i>
<b>Surgery duration</b>	0.9665 (0.9017-1.0121)	<i>0.2363</i>
<b>Surgical experience (100 to 200 TT)</b>	0.0000 (NA-786.8124)	<i>0.9946</i>
<b>Surgical experience (&gt;200 TT)</b>	0.1640 (0.0114-4.1076)	<i>0.1845</i>
<b>Recurrent lymph node dissection</b>	25.1373 (0.8468-32.2042)	<b>0.0347 *</b>

\*  $p < 0.05$ ; \*\*  $p < 0.01$ ; \*\*\*  $p < 0.001$ .  $p$ -value significant (i.e.,  $< .05$ ) indicated in bold.

TT: total thyroidectomies