Original Article

Comparison of short-term postoperative complications of thyroidectomy using ligature and suture ligation

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Abstract

Background: Thyroidectomy is one of the most common forms of operations in general surgery. Regarding the status and importance of thyroidectomy and protective measures for avoiding the surgical complications, we aimed at investigating the short-term postoperative complications of thyroidectomy by applying the two methods of ligature use and suture ligation of vessels.

Settings: Department of Surgery, Shahid Sadoughi University of Medical Sciences, Yazd, Iran.

Materials and Methods: This Double-blind randomized clinical trial study conducted on 140 candidates of thyroidectomy. The patients were randomlyequally allocated assigned to two groups of 70. In the ligature group, thyroidectomy was performed via ligature use, and in the suture ligation group, it was done with suture ligature. Using a specific questionnaire, the required demographic information, type of surgical operation, duration of surgery, rate of bleeding, the preoperative and postoperative serum calcium concentration, hypocalcemia symptoms, hoarseness, and laryngoscopic findings were collected and analyzed.

Results: The findings revealed that the average time of total and subtotal thyroidectomy lasted 93.94 ± 10.53 min with ligature use and 134.15 ± 13.57 min with suture ligation. No case of postoperative bleeding was observed in this study. Two patients (17.1%) in the suture ligation group and two patients in the ligature group showed signs of hypocalcemia. Six patients developed hoarseness of whom five belonged to the ligature group and one belonged to the suture ligation group.

Conclusions: Regarding the fact that on the whole, duration of thyroidectomy was shorter in ligature approach compared to the suture ligation, it can be considered as a suitable method to substitute suture ligation. However, meticulous precautions should be taken specifically with regard to the efferent laryngeal nerve and hoarseness.

Key Words: Complication, ligature, suture ligation, thyroidectomy

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INTRODUCTION

The thyroid gland is one of the most vascular glands in the body and thyroidectomy is one of the most common operations in general surgery.[1] Thyroidectomy can have sequel of consequences. Due to the anatomical status of the thyroid gland, much expertise is needed to control bleeding during surgery. About 1% of cases of thyroidectomy are accompanied by profound bleeding and need to be explored to control bleeding.[2,3] The

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considerable bleeding following thyroidectomy may lead to life-threatening pressure on the airways.[4] Common thyroidectomy complications are damage to the efferent laryngeal nerve and postoperative hypocalcemia.[5] Damage to the efferent laryngeal nerve may be due to separation, ligaturing, or traction and the rate of its incidence is less than 1%.[6] Transient hypocalcemia (due to surgical damage or inadvertent removal of parathyroid glands) has been reported in about 50% of surgical cases; yet, permanent hypothyroidism has been reported in less than 2% of surgeries.[7] Surgical operations on thyroid can be performed using various methods including the ligature approach, suture ligation, metal clips, electro coater, or ultrasonic scalpel. Suture ligation is the most common approach with high safety, but it is time consuming. Ligature is a thermo-electrical gadget designed for ligating vessels. It operates on the principles of giving energy and physical pressure.[8] The energy from ligature reaching the surrounding tissues is less than 1 mm.[9] It has been recently used widely in abdominal surgeries. Also, it is presently applied in surgeries related to the thyroid gland.[10] Regarding the importance and status of thyroidectomy and protective measures for surgical complications, we decided to investigate comparatively the short-term postoperative consequences of thyroidectomy using the two methods of ligature and suture ligation.

MATERIALS AND METHODS

This study is a randomized double-blind clinical trial conducted on 140 candidates of thyroidectomy in Yazd, Iran during April-October 2013 after obtaining the approval of Committee of Ethics at Yazd University of Medical Sciences. Informed written consent was obtained from each patient. The patients were randomly equally allocated assigned to two groups of 70: The ligature group and the suture ligation group. The amounts of calcium, phosphorus, prothrombin time (PT), partial thromboplastin time (PTT), and international normalized ratio (INR) were measured preoperatively for all patients under study. Patients with a history of intake of aspirin, heparin, varfarin, and plavix, patients with impairment of coagulation tests, and calcium impairment were excluded from the study. The required demographic information on age, sex, type of surgical operation, duration of surgery, rate of bleeding, the preoperative and postoperative serum calcium concentration, hypocalcemia symptoms, hoarseness, and laryngoscopic findings were collected using a specific questionnaire and analyzed. All the surgeries were performed by the same surgeon. All the patients were anesthetized with the same procedure. The duration of surgery was calculated from the initial incision in the skin till the closure of skin after the completion of surgery. The patients had weekly follow-up visits after the surgery. The data were completed in follow-up visit. To investigate damage to the efferent laryngeal nerve, fiberoptic laryngoscopy was performed before surgery, 10 days and then 3, 6, and 12 months after surgery.The data were collected and analyzed using the T-test and Chi-square test.

RESULTS

A total of 140 patients were included in the study. The mean age of the patients was 40.59 ± 12.04 years. 125 patients (89.3%) were females and 16 patients (10.7%) were males. Hundred and two (72.9%) patients were affected by benign disease and 38 patients (27.1%) had malignant disease. There were no significant differences between the groups with demographic characteristics. None of the patients in this study developed postoperative bleeding. Only one case of adenophagia was recorded in the suture ligation group who recovered with proper treatment. Fifteen patients (21.4%) in the suture ligation group developed serum hypocalcemia, while in the ligature group only two patients (2.9%) developed this problem. This difference was statistically significant ($P = 0.001$). Furthermore, in 12 cases (17.1%) of the patients in the suture ligation group undergoing thyroidectomy developed signs of hypocalcemia, while only 2 cases in the ligature group developed this complication statistically and was significant difference between two groups ($P = 0.005$) [Table 1]. Additionally, 11 patients (15.7%) in the suture ligation group developed transient hypocalcemia while 2 (2.9%) patients in the ligature group suffered from this complication, the difference between the two being statistically significant ($P = 0.018$).

Our study demonstrated five patients in the ligature group developed hoarseness while only one patient in the suture ligation group developed this complication and the difference was not significant ($P = 0.095$) [Table 2].

Further, all four (2.9%) patients who developed transient unilateral damage to the efferent laryngeal nerve were in the ligature group and this complication was not observed in patients in the suture ligation group. The difference between the two groups was statistically significant ($P = 0.042$). Bilateral transient or permanent nerve damage has not been seen in both groups. The mean duration of surgery in patients undergoing total or subtotal thyroidectomy was 93.94 ± 10.53 min in the ligature approach and 134.15 ± 13.57 in the suture ligation group, the difference between the two being statistically significant ($P < 0.001$). Furthermore, the duration of

surgery for patients undergoing thyroid lobectomy using the ligature and suture ligation approaches was 58.94 ± 8.9 min and 92.92 ± 7.28 min, respectively, the difference being statistically significant ($P < 0.001$) [Table 3].

DISCUSSION

In our study, the mean duration of surgery for the patients undergoing thyroidectomy using ligature was shorter than that of those undergoing the surgery using suture ligation so that the mean duration of surgery for patients undergoing total and subtotal thyroidectomy using ligature was 93.94 ± 10.53 minutes. Additionally, the mean duration of surgery for patients undergoing total and subtotal thyroidectomy using suture ligation was 134.15 ± 13.57 minutes. Moreover, the mean duration of thyroid lobectomy was 58.94 ± 8.90 min using ligature and 92.92 ± 7.28 min with suture ligation. In the study by Turkay *et al*., the duration of surgery was 96.2 min in the ligature group and 115.43 min in the suture ligation group.[11] In the study by Manouras *et al*., the mean duration of surgery was conventional thyroidectomy (CT)=101 min and LigaSure thyroidectomy (LT)=87 minutes.[12] In a study conducted in China, it was shown that duration of surgery was significantly shorter in the LT group. In fact, the duration of total thyroidectomy decreased by 20 min and subtotal thyroidectomy decreased by 21 min.[13] So, our findings complement the results of the previous studies indicating that surgery with ligature can be effective in reducing the duration of surgeries related to thyroid, this reduction in time being advantageous in many cases leading to a decreased anesthesia time. Also, a reduced duration of surgery can increase the efficacy of hospital system. None of the patients participating in our study developed postoperative bleeding. Only one case of adenophagia was recorded in surgery with ligature which recovered with the expected treatment. In addition, there were no cases of bleeding in Milegniatovic *et al*. study.[14] Also, in the study by Turkay *et al*., there was no case of postoperative bleeding in patients undergoing thyroidectomy with ligature; yet, there was one case of bleeding in patients operated with suture ligation.[11] These findings are consistent with ours. In this study, 15 (21.4%) patients undergoing thyroidectomy using suture ligation showed laboratory numerical reduction in calcium while only 2.9% of patients developed this condition with ligature approach. Also, 17.1% operated with suture ligation displayed clinical signs of hypocalcemia. This statistic was 2.9% with the ligature approach. It should be mentioned that only one case of patients undergoing surgery with suture ligation developed permanent hypocalcemia, this not being observed for the patients operated with ligature. Moreover, 15.7% of those operated with suture ligation and 2.9% of those operated with ligature developed transient hypocalcemia and recovered after 3 months. In the study by Turkay *et al*., the amount of transient hypocalcemia was 16.6% in the ligature group and 10.7% in the suture ligation group, the difference between the two not being statistically significant.[11] In the study by Manouras *et al*., reduction in serum calcium concentration in the suture ligation group was greater than that of the ligature group. In another study by Chong *et al*., conducted in Australia, the rate of postoperative hypocalcemia was greater in the suture ligation patients than the ligature group.[15] Furthermore, in the study by Calogero *et al*., conducted in Italy, the amount of transient hypocalcemia in the ligature group and the traditional approach was 7.54% and 7.69%, respectively.[10] Wen *et al*. study also demonstrated that the rate of transient hypocalcemia was 15.15% in the suture ligation and 8.9% in the ligature group.[16] Our findings as same as results of other studies indicated that hypocalcemia is one of the most common postoperative complications of thyroid-related surgeries. It can be significantly smaller with ligature compared to the traditional approaches (suture ligation). It seems, the ligature approach is a safer procedure regarding this complication. In our study rate of transient hypocalcemia is acceptable. According to literatures of transient and permanent hypocalcemiais 7.25% and 0.4-13.8% respectively.[7] In our study, all four (2.9%) patients who developed temporary damage to the

Table 1: Comparison of frequency of hypocalcemia in the two groups under study

Group	LigaSure (%)		Suture ligation (%)		*P**
Hypocalcemia	Yes	No	Yes	No	
Serum calcium	2 (2.9)	68 (97.1)	15 (21.4)	55 (78.6)	0.001
Signs	2 (2.9)	68 (97.1)	12 (17.1)	58 (82.9)	0.005

*Pearson Chi-square test

Table 2: Comparison of frequency of hoarseness in the two groups under study

Group	LigaSure (%)		Suture ligation (%)		*P**
Hoarseness	Number	%	Number	%	
No	65	92.9	69	98.6	0.095
Yes	5	7.1	1	1.4	

*Chi-square test

Table 3: Comparison of mean duration of thyroidectomy in terms of type of surgery in the two groups under study

Group	LigaSure		Suture ligation		*P**
Duration of thyroidectomy (min)	Mean	SD	Mean	SD	
Total and subtotal	94.93	10.53	13.57	134.15	0.001
Lobectomy	58.94	8.9	92.92	7.28	0.001

**t*-test, SD: Standard deviation

efferent laryngeal nerve used the ligature approach. None of the patients who used suture ligation in thyroidectomy developed this complication. All cases of nerve damage were unilateral. Three cases were observed on the right side and onecase on the left side. Of course, none of these cases developed this complication permanently. It should be also noted that none of the patients developed hoarseness. Six patients were affected with transient hoarseness, five of whom used the ligature approach for surgery and only one patient used suture ligation. In the study by Calogero *et al*., the rate of transient paralysis of the efferent laryngeal nerve in the ligature and suture ligation approaches was 1.88% and 1.92%, respectively. Of course, the permanent separation of the efferent laryngeal nerve was not observed in any study.[10] In the study by Khafagy *et al*., the rate of unilateral temporary damage to the efferent laryngeal was observed in three cases of which two cases occurred in the suture ligation group and onecase in the ligature group.[17] Furthermore, in the study by Milegniatovic *et al*., the rate of damage to the efferent laryngeal nerve was 6.1% in the traditional surgery group and 35.4% in the ligature group.[14] The findings above indicate that the rates of damage to the efferent laryngeal nerve are different using various approaches. The temporary thermal damage due to ligature can increase the transient paralysis of efferent laryngeal nerve; yet, this damage is not permanent and is reversed up to 6 months after surgery. The surgeons should take all the necessary precautions related to the efferent laryngeal nerve regardless of which surgical approach they are using for thyroidectomy. It should be mentioned that the rate of temporary damage to this nerve is 2.5%-5% and permanent damage 1.5% in related references.[7]

CONCLUSION

This study showed that the duration of surgery was shorter with the ligature approach compared to the traditional method. Also, it has fewer complications, so that it can be recommended as a suitable substitute for suture ligation. Of course, special care must be taken to avoid any damage to the efferent laryngeal nerve. It should also be considered for its lower costs compared to the conventional methods.

REFERENCES

1. Sosa JA, Bowman HM, Tielsch JM, Powe NR, Gordon TA, Udelsman R. The importance of surgeon experience for clinical and economic outcomes from thyroidectomy. Ann Surg 1998;228:320-30.
2. Abbas G, Dubner S, Heller KS. Re-operation for bleeding after thyroidectomy and parathyroidectomy. Head Neck 2001;23:544-6.
3. Paul W, Bruce H, Valerie J. Cumminge Otolaryngology. 5th ed. Vol. 2, Ch. 122. Philadelphia: Mosby, Elsvier; 2010. p. 1729.
4. Paul W, Bruce H, Valerie J. Cumminge Otolaryngology. 5th ed. Vol. 2, Ch. 123. Philadelphia: Mosby, Elsvier; 2010. p. 1770.
5. Korun N, Aşci C, Yilmazlar T, Duman H, Zorluoglu A, Tuncel E, *et al*. Total thyroidectomy or lobectomy in benign nodular disease of the thyroid: Changing trends in surgery. Int Surg 1997;82:417-9.
6. Brunicardi C, Andersen D, Billiar T. Schwartz Principlles of Surgery. 9th ed. Chapter 38. New York, NY: McGraw-Hill Professional; 2010. p. 1372.
7. Paul W, Bruce H, Valerie J. Cumminge otolaryngology, 5th ed. Vol. 2, Ch. 124. Philadelphia: Mosby, Elsvier; 2010. p. 1771.
8. Riegler M, Cosentini E. Update on LigaSure®/Atlas® vessel sealing technology in general surgery. Eur Surg 2004;36:85-8.
9. Vaiman M, Nagibin A, Olevson J. Complications in primary and completed thyroidectomy. Surg Today 2010;40:114-8.
10. Cipolla C, Graceffa G, Sandonato L, Fricano S, Vieni S, Latteri MA. LigaSure in total thyroidectomy. Surg Today 2008;38:495-8.
11. Kirdak T, Korun N, Ozguc H. Use of ligasure in thyroidectomy procedures: Results of a prospective comparative study. World J Surg 2005;29:771-4.
12. Manouras A, Lagoudianakis EE, Antonakis PT, Filippakis GM, Markogiannakis H, Kekis PB. Electrothermal bipolar vessel sealing system is a safe and time-saving alternative to classic suture ligation in total thyroidectomy. Head Neck 2005;27:959-62.
13. Yao HS, Wang Q, Wang WJ, Ruan CP. Prospective clinical trials of thyroidectomy with LigaSurevs conventional vessel ligation: A systematic review and meta-analysis. Arch Surg 2009;144:1167-74.
14. Ignjatović M, Kostić Z. Thyroidectomy with LigaSure. Surg Today 2011;41:767-73.
15. Chang LY, O'Neill C, Suliburk J, Sidhu S, Delbridge L, Sywak M. Sutureless total thyroidectomy: A safe and cost-effective alternative. ANZ J Surg 2011;81:510-4.
16. Shen WT, Baumbusch MA, Kebebew E, Duh QY. Use of the electrothermal vessel sealing system versus standard vessel ligation in thyroidectomy. Asian J Surg 2005;28:86-9.
17. Khafagy AH, Abdelnaby I. Total thyroidectomy: Ligasure versus Clamp and Knot technique for intraoperative hemostasis. Egyptian Journal of Ear, Nose, Throat and Allied Sciences 2013;14:59-65.

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