

The Effect of Hypothyroidism on Surgical Outcomes Postabdominoplasty: A Case-control Study

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Background: Hypothyroidism is common in surgical patients. The objective of this study is to determine the rate of short- and long-term complications after abdominoplasty for patients treated for hypothyroidism.

Methods: This is a retrospective chart review that enrolled consecutive patients undergoing abdominoplasty across a 5-year period. Cases had a preoperative diagnosis of overt hypothyroidism requiring thyroid replacement therapy, whereas controls are without thyroid disease. Groups were matched by age, gender, comorbidity status (hypertension and diabetes), smoking, and center of surgery in a 3:1 ratio.

Results: There was a total of 61 cases and 183 matched controls followed up for 18 months; most were women (n = 240, 98%) and between the ages of 31 and 45 years (n = 142, 58%). There were no significant differences between cases and controls in any of the sociodemographic and comorbidity status except for current BMI, which was higher for cases than the control ($P < 0.05$). The proportions of all other infections (4.5% versus 1.6%), wound dehiscence (4.7% versus 0.8%), dermatitis (4.7% versus 1.6%), and necrosis (2.3% versus 0%), hematoma (4.7% versus 2.5%) and seroma (2.3% versus 1.6%) formation were higher in cases but not significant ($P > 0.05$). LTCs were not statistically different across groups ($P > 0.05$).

Conclusion: This study did not find a significantly different higher risk of complications after abdominoplasty for patients treated for hypothyroidism. (*Plast Reconstr Surg Glob Open* 2022;10:e4127; doi: [10.1097/GOX.0000000000004127](https://doi.org/10.1097/GOX.0000000000004127); Published online 17 February 2022.)

INTRODUCTION

Hypothyroidism is a common comorbidity that affects between 1% and 7%^{1, 2} of the population. This condition can result in surgical complications, especially those related to surgical wounds,³ due to the role of thyroid hormones in wound healing.⁴ Specifically, experimental studies have shown that a state of hypothyroidism decreases the level of type-IV collagen and hydroxyproline in rat serum, which leads to delayed wound healing.⁵ Treated hypothyroidism, however, was not found to increase postoperative

complications, including wound complications, mortality, or cardiovascular outcomes.⁶ Nowadays, widespread thyroid function testing results in most patients receiving thyroid replacement therapy. For example, it was reported that levothyroxine prescription has increased by 1.74 fold from 2001 to 2009 in the UK.⁷ Thus, many patients are now classified under “treated hypothyroidism.” Because hypothyroidism is 10 times more likely to affect women than men,¹ and women are more likely to opt for abdominoplasty,^{8, 9} studies that investigate the effects of hypothyroidism on surgical outcomes for this patient population are vital. The objectives of this case-control study are to determine and compare the rate of short- and long-term complications for cases treated for hypothyroidism when compared with control patients with no thyroid disease after undergoing abdominoplasty.

METHODS

Study Design and Participants

This is a retrospective chart review that enrolled consecutive patients undergoing abdominoplasty in a tertiary care center over 5 years. Inclusion criteria were patients who are above the age of 18 opting for abdominoplasty

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with cases being those who had a preoperative diagnosis of overt hypothyroidism requiring thyroid replacement therapy whereas controls are without thyroid disease. Patients undergoing surgery would undergo preoperative testing of their thyroid-stimulating hormone levels to ensure good control before surgery. All preoperative values were within normal levels. Primary outcomes were the rate of short- and long-term complications, and the need of operative revisions for cases when compared with control after undergoing abdominoplasty. Secondary outcomes include assessing the effect of hypothyroidism on weight loss dynamics for those who underwent bariatric surgery. To control for confounding and address potential sources of bias, cases and controls were matched by age, gender, comorbidity status (hypertension and diabetes), smoking, and center of surgery in a 3:1 ratio. Missing data were matched on the next available variable.

Measurement of Risk Factors

Factors of demographic characteristics, past medical and surgical history, operative details, and postoperative complications were collected from patient charts using a predetermined data collection excel sheet. A past smoker was one who quit smoking more than 6 weeks preoperatively, whereas those who quit less than 6 weeks preoperatively or currently smoke were classified as active smokers. Comorbidity status was determined according to medical history as documented in the patient's chart, including preoperative consultations and prior medical visits.

Measurement of Outcomes

Outcomes were classified into three major groups. Short-term outcomes are those that occurred during a patient's hospital stay, whereas long-term complications required re-admission or were detected during follow-up. Delayed wound infection occurred after 30 days postoperative; deep vein thrombosis and pulmonary embolism were defined by radiologic evidence, whereas an infection was defined by a positive culture. Redness around incision site was classified as cellulitis, whereas overt dead tissue was diagnostic of wound necrosis.

Statistical Analysis

Means were calculated to summarize continuous variables and compared using t-tests or nonparametric tests as indicated. Categorical data were tested using χ^2 test. A *P* value of less than 0.05 was considered significant. IBM SPSS (v 23) was used for the analysis of data.

Ethical Approval

The study was approved by the ethical committee of the Kuwait Ministry of Health.

RESULTS

A total of 61 cases and 183 matched controls were included in this study. All patients were followed for 18 months. Patients were mostly women ($n = 240$, 98%) and between the ages of 31 and 45 years ($n = 142$, 58%) as in [Table 1](#). All patients were followed up for 18 months after the abdominoplasty procedure. There were no significant

Takeaways

Question: Does a diagnosis of hypothyroidism per se increase the risk of complications after abdominoplasty?

Findings: This case-control study on 244 patients found no significant difference in the occurrence of the following short- and long-term complications after abdominoplasty between patients treated for hypothyroidism and normal controls: infection, wound dehiscence, wound dermatitis, wound necrosis, hematoma or seroma formation, thromboembolic events, delayed wound infection, delayed or abnormal wound healing, and umbilical deformity.

Meaning: This study found that patients treated for hypothyroidism do not carry a significantly higher risk of complications after abdominoplasty.

differences between cases and controls in any of the sociodemographic and comorbidities except for current BMI, which was higher for cases (31.5 ± 6.41) than control (29.5 ± 5.09) with a *P* value of 0.041 ([Table 2](#)). Interestingly, both cases and controls presented for abdominoplasty had similar complaint distribution, as seen in [Figure 1](#), where the majority were mainly disturbed by their skin laxity (75% cases versus 80% control) followed by abdominal bulge (53% cases versus 51% control), and the least contributing factor was functional disturbance (10% cases and 12% control).

[Tables 2](#) and [3](#) show the operative factors of both groups. Cases and controls stayed an average of a week postoperatively in the hospital (7.28 ± 4.21) and had a similar output drain (66.2 ± 56.1). Interestingly, the average ASA score was higher for cases (1.84 ± 0.49) than control (1.45 ± 0.57) with a *P* value less than 0.000. The majority of patients had divarication of the recti ($n = 179$, 73%). Classical abdominoplasty was most commonly performed ($n = 240$, 98%). One third of all patients underwent a concurrent procedure, which is mostly liposuction ($n = 48$, 91% for cases; $n = 17$, 90% control).

Numerically, short-term complications occurred in higher proportions in patients with hypothyroidism as opposed to controls, but this has failed to reach significance ($P > 0.05$; [Table 4](#)). The proportions of all other infections (4.5% versus 1.6%), wound dehiscence (4.7% versus 0.8%), dermatitis (4.7% versus 1.6%), and necrosis (2.3% versus 0%), hematoma (4.7% versus 2.5%) and seroma (2.3% versus 1.6%) formation was higher in cases. Of note, some complications were also seen to occur sooner in cases with an average of 6 versus 14 days for wound dehiscence, 3 versus 9 days for wound dermatitis in contrast to 44 versus 24 days for wound seroma formation. Moreover, around 16% of cases experienced blood loss requiring transfusion as opposed to 13% of controls; this most commonly occurred at the second day postoperatively. With regard to long-term complications, most occurred with similar proportions amongst both groups except for delayed wound healing, which affected 7% of cases when compared with 2.5% of controls, with the difference not being statistically significant ($P > 0.05$).

Table 1. Categorical Sociodemographic Characteristics (n = 244)

Sociodemographic Characteristics	Frequency		Controls*		Cases		P
	n	(%)	n	(%)	n	(%)	
All cases	244	100.0	183	75.0	61	25.0	
Age (y)							>0.05
≤30	23	9.40	16	8.7	7	11.5	
31–45	142	58.2	107	58.5	35	57.4	
≥46	79	32.4	60	32.8	19	31.1	
Gender							>0.05
Men	4	1.60	3	1.6	1	1.6	
Women	240	98.4	180	98.4	60	98.4	
Smoking status							>0.05
Current smokers	17	7.00	13	7.1	4	6.6	
Pack years (10)	5.80	4.44	6.11	4.59	3.00	0.00	
Past smokers	2	0.80	2	1.1	0	0.00	
Nonsmokers	225	92.2	168	91.8	57	93.4	
Comorbidities							>0.05
Diabetic	60	24.6	42	23.0	18	29.5	
Hypertensive	45	18.4	34	18.6	11	18.0	
Asthma	42	17.2	29	15.8	13	21.3	
Anemia	7	2.9	5	2.7	2	3.3	
DVT	3	1.2	3	1.6	0	0.0	
CAD	3	1.2	3	1.6	0	0.00	
Renal disease	3	1.2	1	0.5	2	3.3	
Rheumatological disorder(s)	3	1.2	3	30.0	0	0.00	
Cancer	2	0.08	1	0.5	1	1.6	
H/O pulmonary embolism	1	0.04	1	10.0	0	0.00	
Oral contraceptive use	21	8.60	18	9.8	3	4.9	>0.05

*Controlled for center, gender, age, HTN, diabetes, and smoking in 3:1 ratio.

Table 2. Continuous Sociodemographic and Operative Factors (n = 244; Control: 183, Cases: 61)

Sociodemographic Characteristics	All		Controls*		Cases		P
	μ	Std.	μ	Std.	μ	Std.	
Age	42.1	8.23	42.0	8.21	42.2	8.37	>0.05
Current BMI†	29.89	5.42	29.5	5.09	31.5	6.41	0.041†
Operative factors							
Hospital stay (d)	7.28	4.21	7.27	4.49	7.30	3.25	>0.05
Output (ml/drain/day)	66.2	56.14	67.4	60.04	62.5	42.60	>0.05
Average ASA score	1.55	0.58	1.45	0.57	1.84	0.49	<0.000
Operative time (min)	179.3	60.13	183.2	61.18	167.4	55.65	>0.05

*Controlled for center, gender, age, HTN, diabetes, and smoking in 3:1 ratio.

†Statistically Significant.

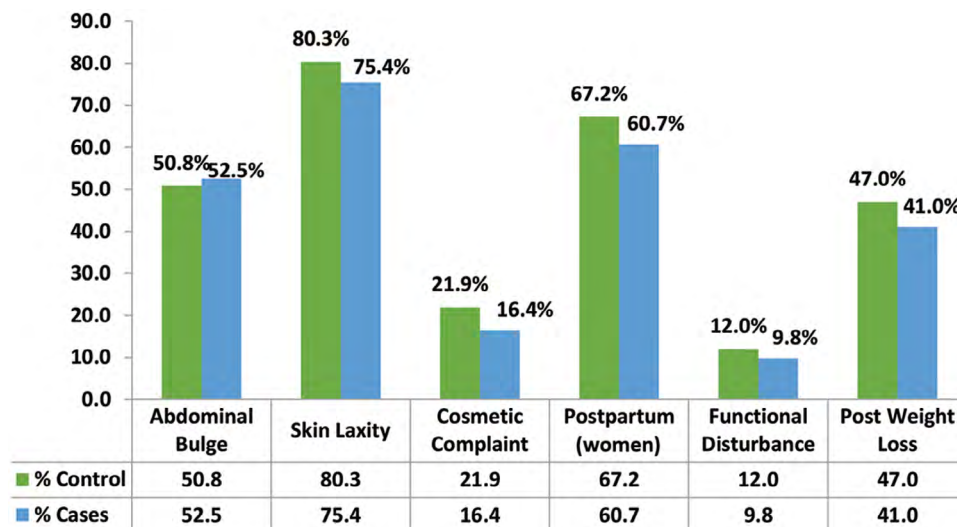


Fig. 1. Distribution of complaints of patients presenting for abdominoplasty.

Table 3. Categorical Operative Factors

Operative Factors	Frequency		Controls*		Cases		P
	n	(%)	n	(%)	n	(%)	
All	244	100.0	183	75.0	61	25.0	
Divarication of recti	179	73.4	132	72.1	47	77.0	>0.05
Abdominoplasty technique							>0.05
Classical	240	98.4	179	97.8	61	100	
Mini-abdominoplasty	4	1.60	4	2.2	0	0.00	
Concurrent procedures	72	29.5	53	28.9	19	31.1	>0.05
Liposuction	65	90.3	48	90.6	17	89.5	
Belt lipectomy	5	6.9	3	5.7	2	10.5	
Laparoscopic cholecystectomy	2	2.8	2	3.8	0	0.00	

*Controlled for center, gender, age, HTN, diabetes and smoking in 3:1 ratio.

DISCUSSION

Abdominoplasty procedures are being performed increasingly and experienced a growth of 382% during the last decade.¹⁰ This is largely mirroring the increase in bariatric surgery procedures in recent years.¹¹ The majority of complications post abdominoplasty are attributed to wound healing.⁸ The mechanism by which hypothyroidism is thought to increase complications is through its effect on proliferating fibroblasts, which are essential for wound healing.^{5, 12} In vivo studies in animals have found thyroxine hormone (T3) to have beneficial effects on wound healing.^{13, 14} Topical application of supraphysiologic T3 doses resulted in 58% greater wound closure as well as increased wound healing-associated keratin 6 protein expression in a dose-dependent manner.¹³ In addition, a prospective controlled trial on guinea pigs found that topical T3 application was associated with a significant and dose-dependent reduction in wound surface area through contraction, which enhanced wound healing.¹⁴ On the other hand, a randomized control trial in 12 mice investigated the effects of T3 cream on wound healing and found that healing was better for the treated group when compared with control, but a significant difference could not be detected.¹⁵

The association between hypothyroidism (decreased serum thyroxine levels) and surgical complications has been studied by Landenson et al,¹⁶ who reported it to be associated with intraoperative hypotension in noncardiac surgery and an increased risk of gastrointestinal and neuropsychiatric complications. They, however, found no association with hypothyroidism and perioperative blood loss, duration of hospitalization, delayed anesthesia recovery, impaired wound healing, abnormal tissue integrity, or death. Similar findings were also reported by Komatsu et al,⁶ who carried out a retrospective cohort study on patients who have hypothyroidism (n = 800), treated hypothyroidism (n = 1805), and are euthyroid (n = 5612) and reported that hypothyroidism was not associated with worse postoperative mortality and wound or cardiovascular outcomes in noncardiac patients. Our study, which included hypothyroid patients with normal plasma thyroid function, had similar findings in that both our patient groups were hospitalized for a week, had similar blood loss data, anesthesia recovery times, and wound complications. Specifically, we did not find significantly higher rates of short- and long-term complications in hypothyroid patients as opposed to control. A state of hypothyroidism, treated or not, seems to have no clinical implication on wound complications despite the theoretical risk discussed above.

Table 4. Postoperative Complications (n = 244)

Complication	All			Controls*			Cases			P
	n	(%)	POD - μ	n	(%)	POD - μ	n	(%)	POD - μ	
All	244	100	—	183	100	—	61	100	—	
Short-term complications	27	11.1	—	16	8.7	—	11	18.0	—	>0.05
Deep vein thrombosis	2	0.80	2.00	1	0.8	3.00	1	2.3	1.00	0.454
Pulmonary embolism	3	1.20	10.3	3	2.5	10.33	0	0.00	—	0.402
Surgical site infections	2	0.80	15.0	2	1.6	15.00	0	0.00	—	1.00
Other infections	4	1.60	1.75	2	1.6	2.00	2	4.5	1.50	0.281
Wound dehiscence	3	1.20	8.67	1	0.8	14.00	2	4.7	6.00	0.167
Wound dermatitis	4	1.60	7.00	2	1.6	9.00	2	4.7	3.00	0.279
Wound necrosis	1	0.40	19.0	0	0.00	—	1	2.3	19.00	0.262
Seroma	5	2.00	32.2	3	2.5	24.33	2	4.7	44.00	0.606
Hematoma	3	1.20	2.33	2	1.6	2.00	1	2.3	3.00	1.00
Blood loss†	34	13.9	1.65	24	13.1	1.71	10	16.3	1.50	>0.667
Long-term complications	16	6.6	—	11	6.0	—	5	8.2	—	>0.05
Delayed wound infection	4	1.60	57.0	3	2.5	69.3	1	2.3	20.0	0.721
Delayed wound healing	6	2.50	39.8	3	2.5	19.0	3	7.0	60.7	0.183
Abnormal wound healing	5	2.00	258.2	4	3.3	300.3	1	2.3	90.0	1.00
Umbilical deformity	1	0.40	20.0	1	0.8	20.0	0	0.00	—	1.00

*Controlled for center, gender, age, HTN, diabetes and smoking in 3:1 ratio.

†Blood loss requiring transfusion.

With regard to the complication profile of abdominoplasty, Winocour et al⁹ carried out a multivariate analysis on 25,478 patients and reported that the most common complications post abdominoplasty were hematomas, infections, and thromboembolism. Our analysis showed similar findings as thromboembolism affected 2% of all our patients while infection rates and hematoma or seroma formation reached 2.4% and 3.2%, respectively. Winocour et al,⁹ moreover, indicated that the significant risk factors for complications post abdominoplasty were male gender, age, BMI of 30 or greater, and performing combined procedures. The differential analysis we conducted across hypothyroid cases versus control showed similar prevalence of these factors in both groups; thus, they could not have been potential confounders of our results.

Strengths and Limitations

This study is the first to address the effect of controlled hypothyroidism on complications postabdominoplasty. We investigated a large range of complications that are properly defined and adjusted for multiple confounding variables. We followed all patients for 18 months, which is sufficient time for the purpose of this study. However, this study is not without limitations. The sample size of the case arm is limited; thus, this study is underpowered.

CONCLUSION

Taking the findings of this study into consideration, a state of controlled hypothyroidism is not associated with increased short- or long-term complications after abdominoplasty.

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REFERENCES

- Vanderpump MP. The epidemiology of thyroid disease. *Br Med Bull.* 2011;99:39–51.
- Gusseklou J, van Exel E, de Craen AJ, et al. Thyroid status, disability and cognitive function, and survival in old age. *JAMA.* 2004;292:2591–2599.
- Rosko AJ, Birkeland AC, Bellile E, et al. Hypothyroidism and wound healing after salvage laryngectomy. *Ann Surg Oncol.* 2018;25:1288–1295.
- Safer JD, Crawford TM, Holick MF. A role for thyroid hormone in wound healing through keratin gene expression. *Endocrinology.* 2004;145:2357–2361.
- Natori J, Shimizu K, Nagahama M, et al. The influence of hypothyroidism on wound healing. An experimental study. *Nihon Ika Daigaku Zasshi.* 1999;66:176–180.
- Komatsu R, You J, Mascha EJ, et al. The effect of hypothyroidism on a composite of mortality, cardiovascular and wound complications after noncardiac surgery: a retrospective cohort analysis. *Anesth Analg.* 2015;121:716–726.
- Taylor PN, Albrecht D, Scholz A, et al. Global epidemiology of hyperthyroidism and hypothyroidism. *Nat Rev Endocrinol.* 2018;14:301–316.
- Schlosshauer T, Kiehlmann M, Jung D, et al. Post-bariatric abdominoplasty: analysis of 406 cases with focus on risk factors and complications. *Aesthet Surg J.* 2021;41:59–71.
- Winocour J, Gupta V, Ramirez JR, et al. Abdominoplasty: risk factors, complication rates, and safety of combined procedures. *Plast Reconstr Surg.* 2015;136:597e–606e.
- The Aesthetic Society. Aesthetic Plastic Surgery National Databank Statistics for 2020. Published 2020. Available at <https://cdn.theaestheticsociety.org/media/statistics/aesthetic-plasticsurgerynationaldatabank-2020stats.pdf>. Accessed January 2022.
- Campos GM, Khoraki J, Browning MG, et al. Changes in utilization of bariatric surgery in the United States from 1993 to 2016. *Ann Surg.* 2020;271:201–209.
- Davis FB, Mousa SA, O'Connor L, et al. Proangiogenic action of thyroid hormone is fibroblast growth factor-dependent and is initiated at the cell surface. *Circ Res.* 2004;94:1500–1506.
- Safer JD, Crawford TM, Holick MF. Topical thyroid hormone accelerates wound healing in mice. *Endocrinology.* 2005;146:4425–4430.
- Kassem R, Liberty Z, Babaev M, et al. Harnessing the skin-thyroid connection for wound healing: a prospective controlled trial in guinea pigs. *Clin Exp Dermatol.* 2012;37:850–856.
- Tarameshloo M, Norouzian M, Zarein-Dolab S, et al. A comparative study of the effects of topical application of Aloe vera, thyroid hormone and silver sulfadiazine on skin wounds in Wistar rats. *Lab Anim Res.* 2012;28:17–21.
- Ladenson PW, Levin AA, Ridgway EC, et al. Complications of surgery in hypothyroid patients. *Am J Med.* 1984;77:261–266.