



Laparoscopic Surgery Effects Thyroid Functions

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Abstract

Introduction: Serum concentrations of thyroid hormones may be affected during course of non-thyroidal illnesses such as sepsis, surgery, myocardial infarction, bypass surgery, starvation, bone marrow transplantation. This condition is defined as "sick euthyroid syndrome". Surgical trauma is one of the factors, in which the serum thyroid hormone levels were affected in the absence of abnormalities in thyroid gland functions. The influences of surgical trauma on serum level of thyroid hormones have been investigated in several studies. However, there are controversial findings exists about the changes of the serum levels.

Surgical trauma causes endocrine and immune responses related with the degree of trauma. It is well known that laparoscopic operations cause less tissue injury and systemic stress responses than open surgery. There are a few available reports about the effect of laparoscopic surgery on serum thyroid hormone levels. The aim of this study was to evaluate the effects of surgery trauma on thyroid functions in subjects underwent laparoscopic cholecystectomy.

Patients and Methods: Forty subjects who undergoing elective laparoscopic cholecystectomy for gallstone disease were included in this study. The patients who have thyroidal and endocrinological disorders were excluded from this study. Preoperative values of thyroid function tests evaluated. The euthyroid patients were included in this study. The cases were operated on same anaesthetic protocol with general anaesthesia and standard laparoscopic technique using 4 trocars. The patients who converted to open procedure were excluded from this study. Venous blood samples were taken before operation 30th min and 2nd and 24th hr afterwards for measurement of the levels of TSH, free triiodothyronine (T3), total T3, free thyroxin (T4), total T4, cortisol and albumin.

Introduction

Biochemistry analysis: The venous samples were measured for total T3, free T3, total T4, free T4 and TSH by radioimmunoassay method using commercial kits (DPC, USA) kits.

Statistic: The data were evaluated by using the paired Student's t test. $p < 0.05$ was evaluated as statistically significant.

Results

Free T3 and total T3 levels were decreased significantly at postoperative 2nd hr and 24th hr as compared to the preoperative period ($p < 0.05$). However, serum cortisol levels were significantly higher at postoperative 2nd hr and 24th hr than preoperative values ($p < 0.05$). The levels of TSH were lower only at postoperatively 24th hr ($p < 0.05$). The changes of free T4, total T4 and albumin values were not statistically significant ($p > 0.05$).

Discussion

The changes in circulating thyroid hormones are reported after surgical trauma [1-6]. But, controversial results still exists about the changes in the serum levels of these hormones [7-28]. In our study, we demonstrated that free and total T3 and TSH levels were decreased significantly after surgery. There was no significantly change in the total and free T4 levels following surgery.

Thyroid hormones may be influenced by surgical trauma, either by neurogenic pathways or by changes in serum catecholamine, cortisol and cytokines induced by surgery [4,11]. In our study, it was shown that total and free T3 levels decreased in the postoperative period. Our results resemble some of the other studies related with open surgery [10,11,15,19,22]. These results are due to the diminished conversion of T4 to T3 and T4 turn into rT3. [10,23]. It has been suggested that increased glucocorticoids such as cortisol due to surgical trauma cause these changes [4,10]. Chopra et al. [18] showed that pharmacological doses of dexamethasone decreased serum T3 levels and increased serum rT3 levels [18]. Benker et al. [36] reported that increased serum concentrations

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of glucocorticoids in Cushing's syndrome suppress TSH and cause a moderate reduction in serum hormone levels.

It has been demonstrated that there is a relationship between serum TSH and cortisol levels [15]. In our study while serum TSH levels significantly decreased, cortisol levels increased at postoperative 24th hr. Adami et al. [15] also reported that serum TSH levels decreased on the first postoperative day. Increased in the secretion of cortisol after surgical trauma has been shown in many studies [11,19,21,33,35,37]. It has been suggested that increased cortisol level has a suppressive effect on serum concentration of TSH [15]. Suppression in serum concentration of TSH has also been reported in normal and hypothyroid subjects received large doses of glucocorticoids [16]. Decreased levels of TSH and increased levels of cortisol that observed in our study supports the suggestion of the inhibitory effect of cortisol on serum TSH level.

In our study such as some other studies, preoperative and postoperative total and free T4 levels changes not significantly different [10,15,22]. But some authors reported significantly decreased or increased levels of serum T4 levels in postoperative period [11,15,38]. One of the reasons of these different results may be effect of anaesthetic agents. It is reported that some anaesthetic agents may release T4 from the hepatic stores [17]. The decreasing levels of total ve free T3 may be dependent on the decreasing levels of TSH and TSH induce the conversion of T4 to T3. The normal levels of T4 concentration in serum may be explained by this fact.

Our results demonstrated that laparoscopic surgery also affects thyroid hormones status. There are two available reports about investigating these effects. One of them, Sari et al. investigated the possible effects of laparoscopic cholecystectomy operation on the thyroid hormones, cortisol and cytokines, and they have reported that postoperative serum levels of cortisol, TSH, tumor necrosis factor-alpha, soluble interleukin-2 receptor were found to be significantly higher than their corresponding preoperative levels. However, postoperative serum free thyroxine, and free tri-iodothyronine levels were decreased when compared with preoperative levels, respectively. Sari and Sevinc found that cortisol is an important marker of surgical stress which also has close relationship with thyroid functions [21]. Legakis et al. [22] evaluated that the effect of mild surgical stress upon thyroid function, TT4, TT3, rT3 and TSH were measured in twenty-two patients undergoing laparoscopic cholecystectomy before, during, at the recovery room and 24 hr postoperatively. The values of TSH remained within the normal limits with transient changes during the study period. Similarly, TT4 values displayed normal variations within the normal range A decrease of TT3 values was detected early at stage during induction of anaesthesia. TT3 remained at low levels during the peri-operative period, and a further decrease was observed 24 hr postoperatively. The above profile of thyroid hormone metabolism reflects a low-T3 syndrome in patients undergoing laparoscopic cholecystectomy.

Conclusion

In conclusion, surgical stress, which depends on laparoscopic operations, could cause important changes on thyroid function. These changes may be relationship increased cortisol levels that occur after operative injury.

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