Prospective Assessment of Postoperative Pain in Patients Undergoing Minimally Invasive Video-Assisted versus Minimally Invasive Open Thyroidectomy

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ABSTRACT

Introduction: Reduced invasiveness has a potential benefit of reduced postoperative pain however there is a relative paucity of prospective data to confirm this presumption. The analysis of this prospective study was to compare pain score results in patients who underwent minimally invasive video-assisted (MIVAT) versus minimally invasive open thyroidectomy (MIT) and in doing so further extrapolate the potential advantages of video-assisted thyroid surgery.

Materials and methods: A total of 98 patients post minimally invasive thyroidectomy from January 1st to December 31st 2008 are the subject matter of this study. Pain scores (0-10) assigned by the patients shortly after the thyroidectomy and after 24 hours postoperative forms the basic outcome variable. For statistical comparison of the distributions of the pain scores between patients the Kolmogrov-Smirnov (KS) test was employed.

Results: The comparison pain score distribution using the KS test for postoperative assessment yielded a Z-value of 2.84 (P < 0.001). The comparison pain score distribution at 24 hours yielded a Z-value of 1.48 (P < 0.05). These results imply the difference in distributions of pain scores among MIT and MIVAT group to be statistically significant.

Conclusions: We concluded that video-assisted thyroidectomy appears to reduce the pain in patients shortly after the operation and 24 hours postoperative. The reduction is statistically significant. Male patients appear to report less pain compared to their female counterparts.

Keywords: Minimally invasive, Thyroidectomy, Pain, Video-assisted.

INTRODUCTION

The first case report describing an endoscopic thyroid lobectomy was in 1997. Since then centers have furthered the understanding and practice of minimally invasive approaches to the thyroid, particularly in Italy, Japan and USA. New surgical techniques and instrumentation have optimized the intra- and postoperative management of thyroid patients. Endoscopic approaches may be ‘closed’ where no incisions takes place or ‘open’ where an endoscope is passed through a small suprasternal or lateral neck incision in minimally invasive video-assisted thyroidectomy (MIVAT). Our group has also published a minimally invasive approach for conventional thyroidectomy without the use of an endoscope. This minimally invasive thyroidectomy (MIT) results in the patient being left with a cosmetically pleasing scar of just 4 cm and an acceptably low complication rate.

Reduced invasiveness has a potential benefit of reduced postoperative pain, however, there is a relative paucity of prospective data to confirm this presumption. With our consolidated experience in thyroid surgery, we conducted a prospective trial comparing the occurrence of postoperative pain in patients operated for MIVAT vs MIT to check the pain response reported when the patient returned to the ward and 24 hours postoperative.

MATERIALS AND METHODS

Institutional review board approval was obtained for ethical consideration. All patients were treated at our tertiary referral institution at St James Hospital, Dublin, over a one-year period from 1st January to 31st December 2008. A total of 98 patients with minimally invasive partial thyroidectomy (i.e. lobectomy including isthmus) are the subject matter of this study.

Our MIVAT inclusion criteria are similar to those suggested by Miccoli. Gland volume less than 30 ml with nodules equal to or less than 3.5 cm. MIT procedures were reserved for nodules greater than 3.5 cm with gland volume 30 to 50 ml. In all the cases, we employed the Ultracision, Ethicon®, CS-14C ultrasonic scalpel. In brief, the two surgical techniques are similar, the difference being a more confined access in the MIVAT requiring endoscopic visualization. No patients
received premedications. Preoperative subcutaneous injection of local anesthesia (2 cc 1% lidocaine with epinephrine) is performed on all incision lines marked. Totally intravenous anesthesia was performed in all patients with remifentanil, induction dose 0.5 to 1 mcg/kg with maintenance 0.05 to 2 mcg/kg/min; propofol at 100 to 200 mcg/kg/min and rocuronium bromide infused at an initial rate of 10 to 12 mcg/kg/min. We also administered 0.1 to 0.25 mg/kg body weight of morphine 15 minutes before the end of the procedure. Postoperative analgesia on the ward consists of paracetamol (1 gm) q 4 to 6 hours, tramadol 50 mg q 8 hours and diclofenac 50 mg q 8 hours on a prn basis.

Pathologies, for both procedures included follicular nodules or low grade papillary thyroid cancers. Exclusion criterion for included previous conventional neck surgery and a relative contraindication for MIVAT included those patients with significant obesity.

STATISTICAL ANALYSIS

The pain score (0-10) assigned by the patients shortly after the thyroidectomy (upon return to the ward) and after 24 hours postoperation forms the basic outcome variable for analysis. The transition time from the operating room to ward was less than 120 minutes for all patients.

By the very same nature of the outcome variable, non-parametric methods were employed for the statistical analysis and testing. A p-value of less than 0.05 is considered as rare and will be interpreted as evidence against the null hypothesis (statistical significance).

For comparison of the distributions of the pain scores between patients who have undergone MIT and MIVAT, the Kolmogorov-Smirnov test was employed. This test is sensitive to differences in both location and shape of the empirical cumulative distribution functions of the two samples.

Box-plots are used for graphical presentation of the distribution of scores. The lower end of the box aligns with first quartiles (25% of the data will be below the point) and upper end aligns with the third quartile (75% of the data below will be the third quartile) and middle line in the box shows the median.

RESULTS

The age of the 98 patients ranged from 21 to 76 years with a mean of 49.6 years and a standard deviation of 13.8. Basic comparison of patients who had minimally invasive thyroidectomy (MIT) and video-assisted MIT (MIVAT) is presented in Table 1. Male and Female patients were not evenly distributed in the MIT and MIVAT group ($x^2$ with continuity correction = 5.46, p < 0.05). The difference in mean age of the MIT and MIVAT patients is statistically significant with $t(96) = 4.0$ (p < 0.001).

The box-plot (Fig. 1) suggests that the pain scores among patients with MIVAT are lower than that among patients with MIT, both shortly after operation and after 24 hours. Figure 2 reports the maximum pain score reported for MIVAT patients was 5 with the patients reporting their pain score from 1 to 5 almost equally, whereas 37 out of 64 patients (57.8%) of the MIT group reporting a pain score of more than 5. The

| Table 1: Basic comparison of MIT and MIVAT patients |
|---------------------------------|-----------------|-----------------|
| Gender of the patient           | MIT (n = 64)    | MIVAT (n = 34)  | Total (n = 98) |
| Male                            | 18 (28.1%)      | 2 (05.9%)       | 20 (20.4%)     |
| Female                          | 46 (71.9%)      | 32 (94.1%)      | 78 (79.6%)     |
| Age of the patients in years    |                 |                 |                |
| Minimum                         | 23              | 21              | 21             |
| Maximum                         | 76              | 67              | 76             |
| Mean                            | 53.4            | 42.4            | 49.6           |
| Standard deviation              | 12.9            | 12.8            | 13.8           |
| Median                          | 54.0            | 42.0            | 51             |

Fig. 1: The box-plots suggest that the pain scores among patients with MIVAT are lower than that among patients with MIT, both shortly after operation and after 24 hours.

Fig. 2: The maximum pain score reported for MIVAT patients was 5 with the patients reporting their pain score from 1 to 5 almost equally, whereas 37 out of 64 patients (57.8%) of the MIT group reporting a pain score of more than 5. The comparison pain score distribution using Kolmogorov-Smirnov test yielded a Z-value of 2.84 (p < 0.001)
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Smirnov test yielded a Z-value of 2.84 (p < 0.001), implying
the difference in distributions of pain scores among MIT and
MIVAT group to be statistically significant and hence video-
assisted thyroidectomy appears to be advantageous in reducing
postoperative pain in patients.

Figure 3 reports the modal pain score (the score with
maximum frequency) among MIT patients is 4 after 24 hours
postoperative compared to 1 among patients of MIVAT. The
comparison of the pain score distribution using Kolmogorov-
Smirnov test yielded a Z-value of 1.48 (p < 0.05), implying the
difference in distributions of pain scores among MIT and
MIVAT group to be statistically significant and hence video-
assisted thyroidectomy is advantageous in reducing pain in
patients after 24 hours as well. Total 22 out of 64 patients
(34.4%) reported a pain score of 5 or more amongst the MIT
group, while only 1 out of 34 (2.9%) reported the above amongst
the MIVAT group. Figure 4 reports male patients appear to
report less severe pain than their female counterparts but the
difference was not statistically significant.

DISCUSSION

Surgical anatomical site has a profound effect upon the degree
of postoperative pain. Thyroid surgery is rated as being
moderately painful.5,6

Pain causes a myriad of physiological sequelae. Prolonged
pain reduces physical activity leading to venous stasis and an
increased risk of deep vein thrombosis and consequent
pulmonary embolism. Sympathetic response results in heart rate,
cardiac work and oxygen consumption increasing. There may
also be widespread effects on urinary tract and gut motility
resulting in urinary retention and postoperative ileus. Thyroid
surgery has a proven association with high incidence of nausea
and vomiting.7 These morbidities are unpleasant, may be
dangerous and increase hospital admission/patient costs.

Postoperative pain, after thyroid surgery, may have different
identifiers. These include anesthetic intervention, pharyngo-
larypeal morbidity after intubation and neck hyperextension.
In this study, we appreciate that immediate postoperative pain
after thyroid surgery may be related to different medications
including nonsteroidal anti-inflammatory drugs in combination
with paracetamol, oral morphine or local anesthetics,8-12 which
we infiltrate preoperative in all MIT and MIVAT patients.
However, skin incision, surgical approach and dissection have
a synergistic impact on pain. This study has specifically focused
on the minimally invasive approaches to the thyroid. The
MIVAT technique allows delivery of the thyroid lobe through
a smaller incision, with less soft tissue dissection than the more
conventional open technique.13

These results also compliment the already described
cosmetic benefit, which is particularly important in the younger
female patient with little or no neck skin creases. The MIVAT
has clear advantages and demonstrates an impressive statistical
significance for postoperative pain.

Minimally invasive video-assisted thyroidectomy appears
to reduce the pain in patients shortly and 24 hours after surgery.
The reduction is statistically significant. Male patients appear
to report less pain compared to their female counterparts.
It must be noted that the risk of postoperative hematoma
remains. We believe, these results will encourage participation
in this technique, thus leading to further expansion of the
inclusion criteria.

REFERENCES


Fig. 3: The modal pain score (the score with maximum frequency)
among MIT patients is 4 after 24 hours of operation compared to
1 among patients of MIVAT. The comparison the pain score distribution
using Kolmogorov-Smirnov test yielded a Z-value of 1.48 (p < 0.05).

Fig. 4: Male patients appear to report less severe pain than their
female counterparts but the difference is not statistically significant.


