Outcome Measures and Scar Aesthetics in Minimally Invasive Video-Assisted Parathyroidectomy

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Objectives: To compare the scar outcome of video-assisted parathyroidectomy (VAP) with traditional bilateral cervical exploration (BCE) using previously validated scar assessment scales, and to examine the feasibility of introducing VAP into a general otolaryngology–head and neck practice.

Design: A retrospective review of medical records from a prospectively obtained database of patients and long-term follow-up of scar analysis.

 Patients: The records of 60 patients undergoing parathyroidectomy were reviewed: 29 patients underwent VAP and 31 patients underwent an open procedure with BCE. The groups were matched for age and sex. A total of 46 patients were followed up to assess scar outcome.

Main Outcome Measures: The primary outcome was a comparison of patient and observer scar satisfaction between VAP and traditional BCE using validated scar assessment tools: the Patient Scar Assessment Scale and the Manchester Scar Scale. The secondary outcomes were to retrospectively evaluate our results with VAP and to assess the suitability of introducing this technique into a general otolaryngology–head and neck practice.

Results: The average scar length in the VAP group was 1.7 cm, and the average scar length in the BCE group was 4.3 cm. The patients in the BCE group scored higher than the patients in the VAP group on the Manchester Scar Scale ($P < .01$) and on the Patient and Observer Scar Scales ($P = .02$), indicating a worse scar outcome. The mean operative time in the VAP group was 41 minutes compared with 115 minutes in the open procedure BCE group. There was no difference between the 2 groups in terms of postoperative complications.

Conclusions: Video-assisted parathyroidectomy is a safe and feasible procedure in the setting of a general otolaryngology–head and neck practice, with outcomes and complication rates that are comparable to those of traditional bilateral neck exploration. Both patient and observer analysis demonstrated that VAP was associated with a more favorable scar outcome when compared with BCE.

study if it is consistent, reliable, feasible, and valid. The appraisal of such scar assessment tools has focused largely on 2 main features: the intraobserver variability (consistency) and the interobserver variability (reliability). Many described scar assessment tools, such as the Vancouver Scar Scale and more recent modifications of this, the Patient and Observer Scar Assessment Scale and the Manchester Scar Scale, have been shown to be acceptable in terms of consistency, reliability, feasibility, and validity. The Vancouver Scar Scale is the most frequently used, in particular for burn scar assessment, whereas the Manchester Scar Scale has been described as a more appropriate tool for linear scar assessment. The Patient and Observer Scar Assessment Scale also considers patient opinion in the overall analysis.

In 2004, we adopted the minimally invasive video-assisted technique that was pioneered by Miccoli et al. This technique, which is gasless, is performed through a midline incision that relies on external retraction and is assisted by the use of a 30° endoscope. The primary aim of our study was to compare patient and observer scar satisfaction between VAP and traditional BCE using 2 validated scar assessment tools: the Patient Scar Assessment Scale and the Manchester Scar Scale. One criticism of VAP is the steep learning curve that is associated with the procedure. Our secondary aims were to retrospectively evaluate our results with VAP and to assess the suitability of introducing this technique into a general otolaryngology–head and neck practice.

METHODS

We retrospectively reviewed the data on 60 consecutive patients who underwent parathyroidectomy for PHPT by a single surgeon (C.T.) over a 4-year period. To facilitate subjective and objective scar analysis, all patients were contacted and asked to return to the outpatient department a minimal of 6 months after surgery. A telephone interview was conducted with the patients who were unable to return to the clinic. Participants’ charts were reviewed from a prospectively obtained database. All patients with a biochemical diagnosis of PHPT underwent preoperative localization Tc 99m sestamibi scanning with or without ultrasonography. Patients were considered for VAP when a solitary focus of hyperfunctioning tissue was identified on a preoperative localization study. Patients with a history of significant thyroiditis, bulky thyroid disease, previous neck surgery, or a suspicion of malignancy were not considered candidates for VAP. To facilitate a comparative analysis, patients who underwent initial VAP and required conversion to an open procedure were analyzed in the BCE group. If possible, patients in the BCE group were operated on through a minimal-access incision of 4 cm or less. Age, sex, race, operative time, length of hospital stay, and histologic diagnosis were recorded in both groups. Serum calcium levels were routinely recorded every 8 hours after surgery until discharge. The operation was considered successful if the serum calcium levels returned to normal on the first postoperative day. Indirect laryngoscopy was used to record recurrent laryngeal nerve function before surgery and again at the first follow-up visit, 2 weeks after surgery.

TECHNIQUE FOR VAP

Video-assisted parathyroidectomy is performed as previously described. Briefly, it is performed with the patient under general anesthesia with endotracheal intubation and nerve monitoring. The patient is positioned supinely without the use of a shoulder roll. The primary surgeon is positioned to the patient’s right, with the camera operator and first assistant to the left. A second assistant stands at the head of the table to provide external retraction. The video stack is at the head of the table to the left. A 1.5- to 2.0-cm midline incision is made approximately 3 to 4 cm above the sternal notch in a suitable skin crease if possible. The initial dissection is performed without the use of the endoscope. The midline is identified and incised, and the strap muscles are separated from the thyroid gland by blunt dissection. Access to this potential space is maintained by 1 retractor on the strap muscles and carotid artery and 1 on the thyroid gland. A 30° endoscope (8712 BP; Karl Storz, Tuttinglen, Germany) is introduced by the first assistant and points cranially. The strap muscles are completely dissected from the thyroid lobe by the lead surgeon using a blunt suction dissector (No. 474003; Karl Storz) and a blunt dissector (Freer 20-cm elevator 315000; Explorntive Surgical Instruments, Tuttinglen, Germany). The enlarged parathyroid gland is identified and dissected. The gland is retracted and its pedicle is clipped, with care taken not to injure the recurrent laryngeal nerve. The enlarged parathyroid gland is delivered through the cervical incision. Intraoperative QPTH measurements are not routinely used. The strap muscles and platysma muscle are approximated with a 3.0 absorbable monofilament suture (Monocryl; Ethicon Inc, Somerville, New Jersey), and the skin is closed with octyl cyanoacrylate tissue adhesive (Dermabond; Ethicon Inc). No drain is used. The patient’s serum calcium levels are checked every 8 hours after surgery until discharge, usually on the first postoperative day. They are checked again in the follow-up outpatient clinic.

SCAR ANALYSIS

Patient satisfaction with scar outcome was measured using the Patient Scar Assessment Scale, which is 1 part of the Patient and Observer Scar Assessment Scale and is a previously validated scar assessment tool. The scale is scored across 6 domains and ranges from 6 (normal skin) to 60 (Figure 1). The patient scores each of 6 characteristics—pain, itch, color, pliability, thickness, and regularity—on a 0-10 point scale, with 10 representing the worst possible outcome. No time constraint was placed on the patient to complete the questionnaire. Observer scar analysis was performed by a single observer using the Manchester Scar Scale (Figure 2), validated specifically to include assessment of surgical incision scars. This scale is scored across 3 domains, with a total score ranging from 5 (normal skin) to 18, and grades color, surface appearance, contour, distortion, and texture. A 10-cm visual analogue scale was graded by the same observer (P.C.) on a scale ranging from 1 to 10. All data are presented as mean (SD). Statistical analysis of the difference between the 2 groups was obtained with an unpaired t test for comparison of quantitative data and with a c2 test for qualitative data.

RESULTS

A total of 60 patients underwent parathyroidectomy for PHPT between January 2004 and July 2008. Thirty-six patients were potential candidates for VAP based on the aforementioned inclusion criteria: 29 patients underwent successful VAP, and 7 patients required conversion to an open procedure owing to failure to identify the adenoma within a reasonable period. Factors influencing the decision to convert included bulky thyroid dis-
All patients underwent BCE. Forty-six patients (24 in the VAP group and 22 in the BCE group) returned to the clinic for patient Scar Assessment Scale (PSS) and the Manchester Scar Scale (MSS) and the 10-point visual analogue scale (VAS), indicating a worse scar outcome. Data are presented as mean (SD). Error bars indicate SD; asterisks, P<.05 vs VAP group.

The mean age in the VAP group was 61.5 years (range, 19-85 years), and the mean age in the BCE group was 60.5 years (range, 26-92 years). The male to female distribution was 1:3 in the VAP group and 1:9 in the BCE group. All patients had a biochemical diagnosis of PHPT. The mean serum calcium and parathyroid hormone levels were 11.68 mg/dL (to convert to millimoles per liter, multiply by 0.25) and 164 pg/mL (to convert to nanograms per liter, multiply by 1), respectively, in the VAP group and 11.24 mg/dL and 127 pg/mL, respectively, in the BCE group. The average operative time was 41 minutes in the VAP group and 115 minutes in the BCE group. There were 2 cases of transient hypocalcemia in each group but no cases of permanent hypocalcemia or recurrent laryngeal nerve injury. There was no recorded wound infection in either group. All patients in the VAP group had a histologic diagnosis of parathyroid adenoma. Histologic analysis in the BCE group revealed parathyroid carcinoma (n=1), 4-gland hyperplasia, (n=1), parathyroid adenoma (n=28), and normal parathyroid tissue (n=1). The patient with normal parathyroid tissue underwent a scheduled BCE with biopsy of all 4 glands. Neither preoperative sestamibi nor ultrasound scanning demonstrated a solitary focus, and the parathyroid hormone and serum calcium levels were persistently elevated after surgery.

The average scar length in the VAP group was 1.7 cm (range, 1-2 cm), and the average scar length in the BCE group was 4.3 cm (range, 2-10 cm). The score on the Patient Scar Assessment scale was 6.7 (1.4) (range, 6-12) in the VAP group and 9.7 (6.6) (range, 6-38) in the BCE group. Observer analysis scored 5.7 (1.2) (range, 5-8) for the VAP group on the Manchester Scar Scale and 6.7 (1.2) (range 5-9) for the BCE group. This was statistically significant for both patient and observer analysis (Figure 3). The score on the 10-point visual analogue scale was 0.9 (0.8) (range, 0.2-2.5) for the VAP group, and the score for the BCE group was 2.3 (1.5) (range, 0.2-5.1), which was also statistically significant (P < .001).

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### Table 1. Observer Scar Assessment Scale

<table>
<thead>
<tr>
<th>Score</th>
<th>Feature</th>
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<tbody>
<tr>
<td>1</td>
<td>Excellent</td>
</tr>
<tr>
<td>2</td>
<td>Poor</td>
</tr>
<tr>
<td>3</td>
<td>Normal</td>
</tr>
<tr>
<td>4</td>
<td>Mild</td>
</tr>
<tr>
<td>5</td>
<td>Moderate</td>
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<tr>
<td>6</td>
<td>Severe</td>
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<tr>
<td>7</td>
<td>Keloid</td>
</tr>
<tr>
<td>8</td>
<td>Hypertrophic</td>
</tr>
<tr>
<td>9</td>
<td>Slightly proud/indentured</td>
</tr>
<tr>
<td>10</td>
<td>Flush with surrounding skin</td>
</tr>
<tr>
<td>11</td>
<td>Matte (1)/shiny (2)</td>
</tr>
<tr>
<td>12</td>
<td>Contour</td>
</tr>
<tr>
<td>13</td>
<td>Rough</td>
</tr>
<tr>
<td>14</td>
<td>Firm</td>
</tr>
<tr>
<td>15</td>
<td>Hard</td>
</tr>
</tbody>
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Figure 1. Observer Scar Assessment Scale and Patient Scar Assessment Scale.

Figure 2. Manchester Scar Scale.
To achieve standard of care status, any new surgical approaches must show equivalency in complication rates and outcome. Although the definition of what constitutes a minimally invasive parathyroidectomy is not universally agreed upon, it is generally held that the term minimally invasive can be used only to describe parathyroid procedures that are routinely associated with an incision shorter than 2.5 cm.21 The earliest reports of minimally invasive parathyroidectomy described the use of true endoscopic and video-assisted techniques. Although it is accepted that these techniques provide excellent visualization of the anatomical structures, they are thought to be time consuming and associated with a steep learning curve.22 Long-term results from 2 large endocrine surgery units, each reporting on over 300 patients, demonstrated that VAP is a safe and feasible procedure in selected cases.6,9 In our series, we adopted the minimally invasive video-assisted technique of Miccoli et al.6 In their series of 520 patients, VAP was performed on 370 patients, with conversion to conventional bilateral exploration in 23 patients (6%). In our series, 36 patients (59%) were initially considered suitable for VAP, and 7 of these patients (19%) required conversions to open exploration. Despite the small numbers of patients undergoing VAP, the mean operative time was 41 minutes, which shortened considerably as the series progressed. This finding should encourage other general head and neck surgeons to adopt this technique. Another criticism of VAP is the need for expensive equipment.23 We found that this was not a significant consideration because, other than a Miccoli suction dissector, the equipment that was required was already available in the operating room.

One concern with the use of any targeted technique is a higher incidence of persistent PHPT resulting from a failure to recognize multigland disease or double adenoma. Miccoli et al6 reported a rate of 1.8% of persistent PHPT in their series of more than 300 cases, which does not exceed the rate that was reported in large series of patients who underwent bilateral open procedures. They, and others, use intraoperative QPTH monitoring as an adjunct to ensure that all hyperfunctioning parathyroid tissue has been removed.10,24-26 Although QPTH estimation is an accurate test in predicting cure in single-gland disease, it is unreliable in detecting multigland disease.27 Agarwal et al28 reported that 97% of patients are cured by minimal-access surgery without the need for assessment of parathyroid hormone levels. Also, they estimated that high false-positive and false-negative rates significantly reduced its cost-effectiveness when it was used as part of the intraoperative decision-making process. With positive preoperative localization scan results, an experienced parathyroid surgeon generally has the ability to differentiate between a normal and an abnormal parathyroid gland. Quick parathyroid hormone assays are not routinely used in our institution, and our surgical cure rate of 98% represents a willingness to convert to an open procedure when an abnormal gland is not immediately identified with a targeted approach.

The proposed advantages of a VAP technique include better visualization of the recurrent laryngeal nerve, decreased postoperative pain, shorter operating time, and improved cosmesis.6,9,21 Although a smaller scar instinctively translates into improved patient satisfaction, there is relatively little in the literature to substantiate this. O’Connell et al14 used validated scar scales to assess patient scar satisfaction comparing minimal-access parathyroid surgery with conventional thyroidectomy scars. The average scar length in each group was 3.36 cm and 7.58 cm, respectively. The authors determined that although the conventional thyroidectomy group was more satisfied with scar outcome on a 10-point visual analogue scale, there was no significant difference between the groups using validated patient and observer scar scales. They acknowledged that the difference on the visual analogue scale was so small that it was likely not to have clinical significance, surmising that there is no difference in patient satisfaction between the 2 groups in their study population. It is rarely necessary to perform a BCE through the traditional Kocher incision of 8 to 10 cm. Many clinicians agree that bilateral parathyroid exploration can generally be performed through a 4- to 5-cm incision, making the comparison for minimally invasive scars to larger traditional scars misleading.21,29,30 This reduced average length of incision for open conventional parathyroidectomy should be taken into account when advantages and disadvantages of new minimally invasive approaches are evaluated.21 The mean scar length in the BCE group in our study was 4.3 cm, which is in keeping with currently accepted practice. In contrast to O’Connell and colleagues’ group, we found that both patient and observer scar analysis determined that the VAP group had a more favorable outcome than the BCE group, which may be attributable to the lateral placement and the longer scar length (3.36 cm) of the minimal-access group in their study compared with the midline placement and the shorter scar length (1.7 cm) in our VAP group. However, we also acknowledge that the difference in the visual analogue scale scores in our study, although statistically significant, may be too small to be of clinical significance. Of note, the mean patient age in our study was 10 years younger than that in O’Connell and colleagues’ cohort.

In conclusion, multiple techniques for minimally invasive parathyroidectomy have been adopted by endocrine surgeons worldwide, with the majority using these procedures on almost 50% of their patients with PHPT.22 It is now recognized that VAP provides excellent results with low complication rates when performed by experienced and specialized endocrine surgeons.23 Our results show that this technique can readily be introduced into a general head and neck practice with comparable outcomes and complication rates. Among the proposed advantages of VAP is a better aesthetic result as, intuitively, a smaller scar should be associated with a better cosmetic outcome. In our series, both patient and observer analysis determined that, in general, the scar outcome in the VAP group was better than that in the BCE group. Video-assisted parathyroidectomy offers other important advantages such as excellent visualization of the recurrent laryngeal nerve and shorter operating time.

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Author Contributions: Dr Casserly had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

Study concept and design: Casserly and Timon. Acquisition of data: Casserly, Kirby, and Timon. Analysis and interpretation of data: Casserly and Timon. Drafting of the manuscript: Casserly, Kirby, and Timon. Critical revision of the manuscript for important intellectual content: Casserly and Timon. Statistical analysis: Casserly and Timon. Obtained funding: Timon. Administrative, technical, and material support: Timon. Study supervision: Timon. Financial Disclosure: None reported.

REFERENCES


