CASE REPORT

Minimally Invasive Neck Dissection (MIND) Using Standard Laparoscopic Equipment: a Preliminary Report and Description of Technique

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Abstract Neck dissection leaves behind an aesthetically unacceptable scar over front of the neck. Various techniques, both endoscopic and robotic, have been tried to avoid this scar. Though comparatively more cases of robotic surgery are reported than endoscopic neck dissection, the cost and availability of robot precludes many patients from getting the benefit of minimally invasive neck dissection (MIND). We performed minimally invasive neck dissection for two carefully selected patients with early oral cancer and cN0. We used standard endoscopic equipment and ubiquitously available laparoscopic ports. We used gas insufflation to create the working space. Our results show that MIND is feasible and oncologically safe. The scars produced are aesthetically better than that of conventional open neck dissection. This procedure leaves no scars in the anterior aspect of the neck. This technique can be replicated at any center with endoscopic equipments without need for purchasing specialised retractors or a robot.

Keywords Selective neck dissection · Oral cancer · Lip cancer · Endoscopic neck dissection · Neck dissection

Introduction

Neck is a part of body which is relevant aesthetically. Unlike other parts of the body an operative scar over neck is always noticed. Conventional open neck dissection (COND) requires large incisions for adequate exposure of nodal stations which leave aesthetically poor scars. Recently published large randomised controlled trial has shown that in oral cancers elective neck dissection has survival advantage over therapeutic dissection when performed on nodal recurrence during followup [1]. Going by this study all the oral cancer patients with clinical N0 neck would benefit by undergoing neck dissection. However, the only concern would be the scar associated with neck dissection especially for a small oral primary. These are the potential candidates in whom neck scars could be avoided. Minimally invasive neck dissection (MIND) performed endoscopically or robotically use minimal access techniques intended to avoid these scars and give esthetic results without compromising on oncological clearance. There has been a limited acceptance of MIND mainly due to the narrow workspace in the neck which makes minimal access surgery difficult. During transaxillary approach to neck authors also have expressed difficulty in dissecting level 1 & 2b due to difficult angle of dissection [2].

Minimal access neck dissection for oral cancers have been performed using either standard endoscopic equipment and robotic technology [2–6]. Presently more literature is available on robotic neck dissection than that performed using standard endoscopic equipment. The presently used approach involves a retroauricular incision by a modified facelift approach [3, 4, 6]. This approach provides a fair access to level 1 nodes, and the level 2 and 3 nodes could be partly dissected under direct vision similar to open approach as the incision is sufficiently long [4]. These surgeries were performed using specialised retractors through a relatively larger posterior neck incision.

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Recently we treated two patients with oral cancer with MIND using conventional laparoscopic instruments and carbon dioxide gas insufflation. The surgical outcomes were aesthetically better than COND.

Case Reports

Case 1

A 56 year old gentleman presented to us with a history of non-healing ulcer of mucosal aspect of lower lip for more than 8 months. An incision biopsy showed well differentiated squamous cell carcinoma. He was a smoker for about 20 years and had quit for 15 years. Ulcerative lesion was located over the right side of mucosal lower lip. The lesion was 2×1.5 cm in size and there were no clinically palpable nodes in the neck (cT1N0M0). No further radiological investigations were performed. He was planned for wide local excision of lip with primary reconstruction and MIND for level 1 to 3 neck nodes. The surgery took 5 h to complete with a total blood loss of less than 100 ml. The histology confirmed the clinical stage (pT1N0). Seven nodes were detected in the specimen and all were negative. There were no postoperative complications. He was discharged on third postoperative day. On 1 year followup the patient is disease free and the scars are invisible.

Case 2

A 54 year old lady presented with a history of an ulcer over the left border of tongue for 6 months, associated with sharp tooth injury. The lesion was 2×2 cm in size with no palpable enlarged lymph nodes in the neck (cT2N0M0). The biopsy of the lesion showed a moderately differentiated squamous cell carcinoma. There was no history of tobacco abuse. She was planned for wide local excision of tongue lesion along with MIND for level 1 to 4 lymph nodes. The surgery took about 5 h to complete with a blood loss of 150 ml. Postoperatively she developed bruises over the upper neck which resolved over 2 days. Patient was discharged on fourth postoperative day without any major postoperative complications. The postoperative histological report confirmed the stage (pT2N0). A total of 12 nodes were identified in the specimen, all of which were histologically negative. This patient developed a second primary in the floor of mouth after 6 months of followup which was operated. Presently the patient is on adjuvant chemo-radiation.

Surgical Procedure

Under general anesthesia the patient was placed in supine position with neck in extension. The anatomical landmarks

Fig. 1 Patient position and anatomical landmarks. Outline of Spinal accessory nerve (SAN), mandible, sternocleidomastoid muscle marked. The primary port (P1), working ports (P2 & P3) and assistant port (P4) are also marked

were identified and the ports were placed as shown in the Fig. 1. The first incision was taken 3 cm below the clavicle and subplatysmal plane was developed using sharp and blunt dissection. A 12 mm port (P1) was placed through this incision and the space was insufflated with carbon dioxide gas at a pressure of 10 mm of Hg. The pressure was kept below 10 mm of Hg to reduce the systemic absorption of CO₂. The plane was further developed after placing working ports medial to the first port (P2) and one near the posterior border of sternocleidomastoid (P3). An assistant port was placed medial to the second working port as medially as feasible (P4). This port was mainly used to retract the sternocleidomastoid muscle. Planes were developed in order to expose the desired lymph nodal levels sufficiently. The extent of flap elevation is guided by surface landmarks that can be palpated externally as well as the anatomical landmarks identified visually.

Fig. 2 Endoscopic exposure posterior aspect of level 1b. The facial artery, facial vein and the posterior belly digastric muscle with tendon are visualised endoscopically

Fig. 3 Endoscopic dissection of level 1b. The lingual nerve and mylohyoid muscle are exposed

We started our dissection in lateral to medial fashion, first identifying the posterior belly of digastric muscle and the facial artery (Fig. 2). The level 1b dissection and level 1a dissection were completed (Figs. 3 and 4). Marginal mandibular nerve (Fig. 5), hypoglossal nerve and lingual nerve could be identified and preserved. The dissection of lymph nodes along internal jugular vein was started from the lower most level (3 or 4 based on the case) and going upwards (Fig. 6). The nodes were accessed by splitting the two heads of sternocleidomastoid muscle. Level 2 dissection was performed by retracting the muscle laterally (Fig. 7). In the first case where supra-omohyoid dissection was performed, the omohyoid muscle was preserved. In the second case the muscle was cut in order to clear level 4 nodes. The specimen was extracted through the posterior neck incision. Thin suction drains were placed. The surgical wound left acceptable scars after healing (Fig. 8).

Fig. 4 Dissection of level 1 a

Fig. 5 Marginal mandibular nerve dissection and preservation

Discussion

Endoscopic surgery for neck was introduced by Gagner in 1996 when he performed first endoscopic parathyroidectomy [7]. With the evolution of endoscopic technology and techniques, studies have been reported on endoscopic surgery for the removal of various organs in the neck. Some authors have evaluated the possibility of performing neck dissection for oral cancers using minimal access approach [2–6, 8].

There are some distinct advantages to MIND compared to conventional open procedure. There are no scars in the frontal aspect of neck and over time the wounds in the neck heal and leave acceptable scars. These patients recover much quicker and have a shorter length of hospital stay than open surgery patients. The maximum length of hospital stay in our case was 6 days which is less than the mean length of hospital stay of 14.55 days reported in enhanced recovery after surgery (ERAS) study for head and neck surgery [9].

Fig. 6 Dissection of level 3 nodes endoscopically. The two heads of sternocleidomastoid muscle are split and the dissection is performed from in between the two heads

Fig. 7 Level 2 dissection. The sternocleidomastoid muscle is retracted laterally

The authors who have described MIND have described use of specialised retractors to retract and hold the flap [3, 4, 6]. We used carbon dioxide gas insufflation which provided us sufficient working space and reduced the size of the incision compared to retroauricular approach used by other authors. We used a 12 mm port in the retroauricular position, which also provided a good working angle to perform level 1 dissection. There was no postoperative subcutaneous emphysema in either of our patients despite using gas insufflation. Unlike in open surgery neither of the patients had any skin flap edema. Neither of the patients developed parasthesia over the neck. We could identify and preserve marginal mandibular nerve, hypoglossal nerve, lingual nerve and spinal accessory nerve. There was no neuropraxia of any of the nerves. The nodal yield of MIND appears to meet the recommended minimum

yield for oral cancer, which is more than 6 nodes for selective neck dissection [10]. We had 7 and 12 nodes in the specimens respectively.

The absence of platysma over anterior part of level 1 makes the skin over the area prone to skin injury due to energy source especially in lean patients. One of our cases had a minor skin injury which was excised and sutured at the end of surgery. This did not make any difference to the overall outcome of the case.

Due to narrow and restricted space in neck, robot presents several technical advantages to the surgeons [5, 6]. However, the availability of robot and its cost are the distinct disadvantages of the technology. The patients remain equally benefited either by robotic surgery or standard endoscopic surgery. The MIND technique described by us involves commonly used and ubiquitously available laparoscopic instruments, and the operative cost is not significantly higher than COND.

In our opinion case selection for MIND should be done with utmost care. This technique would not be appropriate for patients for whom the resection of primary lesion requires opening of neck or removal of mandible as there will not be any aesthetic advantage. These include lesions in bucco-alveolar sulcus, lesions of lower alveolus, etc. This technique is also not mature enough to be used for node positive patients. The techniques of endoscopic neck surgeries are still evolving. We believe that MIND is feasible and oncologically safe and could be considered in carefully selected cases. However, larger series or randomised trials with long term followup are needed in-order to produce conclusive results.

In conclusion MIND is feasible, safe and aesthetically superior. The hospital stay is shorter. This technique can be replicated at any centre with laparoscopic equipment without

Fig. 8 Postoperative scars as seen on postoperative day 7 (a) and day 30 (b)

the need for specialised equipments. Larger longterm studies are needed to standardize this technique.

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