Incidence of chest wall paresthesia after video-assisted thoracic surgery for primary spontaneous pneumothorax

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Abstract

Objective: Video-assisted thoracic surgery (VATS) is an established treatment for recurrent or complicated primary spontaneous pneumothorax (PSP). However, a proportion of patients still complains of chronic pain or discomfort after VATS pleurodesis. We aimed to investigate if paresthesia is a distinct component of the post-operative discomfort in patients receiving VATS for PSP.

Methods: Telephone interviews were conducted with 52 patients who had received VATS pleurodesis for PSP in our institute during a defined 24 month period. A standardized questionnaire was used to identify paresthetic discomforts which the patients themselves could distinguish from their wound pain. Responses were obtained from 51 patients (42 male, 9 female) with a mean age of 24.1 years (range 14–63 years), giving a response rate of 98.0%.

Results: With a median observation time of 19 months (range 2–24 months), 27 patients (52.9%) reported experiencing paresthesia as a post-operative complication distinct from their wound pain. The most commonly described characteristics of the paresthesia were ‘pins and needles’ (37.0%), ‘numbness’ (25.9%) or a sensation of abnormal ‘swelling’ in the chest wall (11.1%). Although only two of the affected patients (7.4%) described the paresthesia as ‘severe’, consequent functional disturbances in daily life were noted by seven patients (25.9%), and 11 patients (40.7%) actively sought medical or alternative, holistic therapies to relieve the paresthesia. Eight (21.0%) of the 38 patients followed-up for over 12 months after surgery still experienced the paresthesia.

Conclusions: Although it should not detract from the proven advantages of VATS, paresthesia in the chest wall represents a distinct but previously overlooked post-VATS complication. It is a potential source of significant post-operative morbidity, and may run a chronic course in some patients. Further study is warranted to elucidate its mechanisms and optimum management.

Keywords: Chest wall; Complications of surgery; Neurologic injury; Pneumothorax; Video-assisted thoracic surgery

1. Introduction

Video-assisted thoracic surgery (VATS) is now widely recognized to be as effective as open surgery for a variety of diagnostic and therapeutic conditions, but with significantly less morbidity [1,2]. This is epitomized in the treatment of primary spontaneous pneumothorax (PSP), where VATS pleurodesis with lung bleb excision has been shown to give shorter hospital stays, reduced analgesics requirements, and probably reduced respiratory impairment post-operatively when compared to open surgery [3–8]. VATS pleurodesis is now regarded as the standard of care in many centers for patients with recurrent, persistent or complicated PSP [8,9].

Nevertheless, there are continual reports that chronic pain can still afflict up to 63% of patients after VATS pleurodesis, and can persist for up to several years after surgery [6,7,10,11]. Although the pain is usually mild and non-debilitating in many cases, it is curiously refractory to conventional analgesic strategies. Many strategies have been proposed to combat this problem, including modifications to surgical technique (such as using smaller wounds or reducing torquing at the wounds), pre-emptive local analgesia, intercostal nerve blockade, or early aggressive post-operative pain control [12–16]. Yet despite these, the reported incidences of chronic post-VATS pain have remained largely similar over the years. Furthermore, it has been observed that even as surgeons gain increasing experience with VATS, and as learning curves are passed,
these rates of post-VATS pain or discomfort are not demonstrably reduced [10,11].

More detailed observation shows that the chronic pain or discomfort being reported can present in a large variety of ways. The pain has been variously described as being ‘sharp and piercing’, ‘deep and penetrating’, ‘burning’, ‘cramping’, or ‘dull and unspecific’ [10,11,17]. The site of the discomfort has also been variable, with patients describing it as being ‘at the scar’, ‘segmental’, ‘diffuse’, or ‘in the arm’ [7,17]. In a study of 173 patients who had received VATS for a variety of benign diseases, a clear distinction could be made between those who had ‘localized wound pain’ and those with a more ill-defined, diffuse ‘chest wall discomfort’ [17]. This diversity of presentations suggests that the post-operative pain may not be a single, homogeneous entity.

A few other studies have made brief mention that some patients report a numbness, dysesthesia or paresthesia after VATS [6,11,18,19]. In one case series of VATS resection of posterior neurogenic tumors, 13% of patients described transient post-operative chest wall paresthesia [18]. In another series of 144 patients receiving VATS for various benign diseases, 16.9% reported numbness distal to the incision sites, and 8.3% described dysesthesia [19]. The possibility that paresthesia may be a component of the post-operative ‘pain’ or discomfort being described by patients after VATS is thus raised. However, these few reports do not explore the characteristics of the paresthesia in any further detail, and to our knowledge, there are no previous reports in the literature investigating paresthesia as a specific post-VATS condition.

We therefore conducted a survey to identify if paresthesia is a post-VATS complication that is distinct from classical wound pain, and if so, what is the scale of the problem and how does it affect patients.

2. Methods

2.1. Patients and data collection

For homogeneity of the patient cohort, we selectively studied only patients presenting with PSP and who underwent uncomplicated VATS pleurodesis surgery.

A retrospective cohort study was performed. From review of our operation records, 84 patients were identified who received VATS pleurodesis at our institution between July 1, 2001 and June 30, 2003. Patients were excluded from this study if their pneumothorax was not primary and spontaneous in nature (n = 5), if they had other thoracic surgery performed before or after the VATS pleurodesis (including redo-VATS pleurodesis; n = 2), if they required management of a post-operative air leak by talc slurry pleurodesis or redo-VATS (n = 3), or if they had identifiable factors which may significantly alter their pain experience (such as history of analgesia abuse, or significant injury or pathology in the chest; n = 2). Patients were also excluded if they had moved away from their given contact addresses, changed their phone numbers, or were otherwise unreachable for study (n = 20). This relatively large number of patients who could not be contacted probably reflects the social dynamics of this younger population in Hong Kong, who at this age may have moved away from home, changed mobile phone numbers frequently, or have moved to work in mainland China since the time of their surgery. There remained 52 patients with PSP who had received uncomplicated VATS pleurodesis, who were contactable and eligible for study.

A questionnaire-based survey was conducted for all 52 patients by telephone interview. One patient refused to participate, giving a response rate of 98.1%. The remaining 51 patients included 42 males and 9 females, and had a mean age of 24.1 years (range 14–63 years). VATS pleurodesis was performed on the left side in 24 patients, on the right side in 23 patients, and bilaterally in 4 patients.

Participating patients were asked if they could recall the wound pain after surgery, and if they experienced any paresthetic discomfort in addition to that pain. For the purposes of this study, ‘paresthesia’ has been defined as any numbness or disordered sensation causing chest wall discomfort which the patient can distinguish clearly from the wound pain. Patients with such paresthesia were asked to describe the site and the characteristics of any paresthetic discomfort in their own words. Patients were also asked to subjectively grade the severity of any paresthesia on a 10-point analog scale (with 1 being minimal discomfort and 10 being the worst discomfort imaginable). We regard paresthesia severity of 1–3 on the 10-point scale to be ‘mild’, 4–7 to be ‘moderate’ and 8–10 to be ‘severe’. Affected patients were also questioned regarding the perceived effect of the discomfort of their daily lives, and how they responded to the discomfort if at all.

2.2. Operative protocol

We used standard guidelines of indications for VATS pleurodesis for PSP in all 52 patients [4]. Our technique for VATS pleurodesis in all patients has been reported [5,12]. We employ single-lung ventilation with double-lumen tracheal intubation. We use three 10 mm ports, but only use a trocar for the camera port and emphasize minimal torquing during instrumentation via each port. Local infiltration with 0.5% bupivacaine is given pre-emptively prior to creating each port. We conduct a systematic search for lung blebs, and resect these with an endoscopic stapler (Endo-GIA 30, Auto Suture, Tönisvorst, Germany). Mechanical pleurodesis is achieved by mesh abrasion of the entire parietal pleural surface. At the end of the procedure, we place one 24 French chest tube via the camera port (usually the lowermost) and apply 15 cmH₂O of suction. The other wounds are closed in two layers. The chest tube is removed at 24 h after surgery, provided there has been no air leak.
Our standard post-operative analgesics regime for all patients consists of 650 mg of paracetamol with 65 mg of dextropropoxyphene given orally five times a day, starting as soon as the patient is fully awake. Intramuscular opiates are made available to the patient, but only given upon request. On discharge, patients are prescribed a generous supply of paracetamol to take on an ‘as required’ basis.

3. Results

The median observation time was 19 months (range 2–24 months). The results are summarized in Table 1. All 51 participating patients reported experiencing some degree of sharp, localized wound pain immediately after surgery. However, 27 patients (52.9%) reported experiencing paresthetic discomfort in addition to that wound pain. All 27 affected patients confirmed that the paresthesia was a distinct chest wall discomfort different in site and/or nature from the wound pain. In all the affected patients, the onset of paresthesia was noted within 1 week of surgery.

The most common descriptions of the paresthetic discomfort were of ‘pins and needles’ (10 patients; 37.0%), ‘numbness’ or ‘decreased sensation’ (7 patients; 25.9%), and ‘swelling or bloating’ (3 patients; 11.1%) in the chest wall on the operation side.

The two most common sites of the paresthesia were diffusely in the lower, antero-lateral chest wall on the operation side (14 patients; 51.9%), and vaguely around the territory of the VATS wounds (11 patients; 40.7%). One patient (3.7%) felt the discomfort in the shoulder and upper arm. One patient (3.7%) felt it throughout the entire ipsilateral thoracic and abdominal trunk.

Specific factors which exacerbated the paresthesia could be identified in 22 patients (81.5%). A third of the affected patients claimed that the paresthesia was noticeably exacerbated by exertion, while others noted increased paresthesia on touch, after prolonged periods of inactivity, or during changes in the weather.

On a 10-point analog scale, only two affected patients (7.4%) described the paresthesia as being severe (grade 8–10). However, seven patients (26.0%) described functional disturbances of their daily lives as a result of the paresthesia. These included sleep disturbance (4 patients; 14.8%), impaired work performance (2 patients; 7.4%) and subjective reduction in exercise tolerance (2 patients; 7.4%). The paresthesia prompted patients to seek specific methods of relief in 11 cases (40.7%), with five patients (18.5%) choosing conventional medical therapy and seven (26.0%) trying alternative medical or holistic approaches. The latter included deep breathing or Chinese Qigong exercises, massage therapy, or the application of local heat therapy.

In the 45 patients who were followed-up for over 6 months (including 23 affected patients), nine (20.0%) reported that the paresthesia persisted at 6 months after surgery. In the 38 patients who were followed-up for over 1 year (including 18 affected patients), eight (21.0%) still experienced paresthesia at 12 months after surgery.

4. Discussion

In this study, 52.9% of patients receiving VATS for PSP reported experiencing paresthetic chest discomfort which was distinguishable from normal post-operative wound pain. The descriptions of the paresthesia are notably different from those of classical sharp, localized wound pain, and appear more similar to descriptions of neuropathic pain [20,21]. Significantly, all 27 affected patients claimed to be able to clearly distinguish the paresthesia from the post-operative wound pain. To our knowledge, this is
the first documentation in the medical literature of chest wall paresthesia as a specific post-VATS complication.

We have found that 21.0% of patients can still have paresthesia at 12 months after VATS pleurodesis. In comparison, paresthesia or dysesthesia has previously been reported in 28.2% of patients at 1 year after thoracotomy, and hypoesthesia in 16.5% [22]. Put into perspective, chronic pain has previously been reported to be prevalent in 30% of patients at 1 year after VATS [23].

It is also notable that 26.0% of the affected patients claimed that the symptoms had noticeable adverse effects on their daily lives, and 40.7% of patients actively sought palliative treatment to relieve the discomfort in addition to the conventional analgesics prescribed to them. It was previously noted that the majority of patients do not proactively seek help for pain even after thoracotomy [23]. Therefore, we find the latter figure particularly noteworthy, and indicative of the morbidity caused by the paresthesia.

It also appears that the paresthesia spontaneously resolves in a proportion of patients in the first several months after surgery. In about a fifth of patients, the discomfort persists at 6 months post-operatively, and if still present at that point, it tends to run a chronic course with a similar proportion of patients still having symptoms at 12 months.

The mechanism for the paresthesia is not yet ascertained, but during VATS, it is possible that inadvertent torquing of the camera or instruments in the ports can compress on the intercostal nerves, causing damage [8]. This mechanism was previously suggested to be responsible for causing post-VATS pain [23], but it may also be responsible for the paresthesia. The diffuse distribution of the paresthesia compared to localized wound pain possibly reflects the wide area of chest wall supplied by the damaged intercostal nerve ‘downstream’ from the VATS port. It should also be noted that a number of affected patients in this study described their discomfort as having ‘electric shock’ or ‘heat’ characteristics, and noted that ‘touch’ could exacerbate the discomfort. These descriptions and the hyperesthesia are typical features of neuropathic pain [21], lending greater weight to the argument that the paresthesia can result from intercostal neural dysfunction. It has been demonstrated that neurophysiologic damage can indeed follow thoracic surgery, possibly leading to neuropathic pain [20]. Further studies will be required to confirm this hypothesis.

Whatever the pathophysiology, paresthesia appears refractory to conventional analgesics as around 40% of the affected patients sought alternative treatments in this study. This is consistent with paresthesia being a distinct problem from classical wound pain. If the intercostal nerve trauma hypothesis is correct, avoiding excessive levering of the camera and instruments against the wounds during surgery may reduce the paresthesia. The routine use of intercostal neural blockade might also be considered [13,16]. However, it should be interesting to see if such neural blockade might in fact be a cause of paresthetic symptoms by inducing intercostals neural dysfunction.

In addition, should the neuropathic mechanism be valid, the role of transcutaneous electrical nerve stimulation (TENS) and vitamin B therapy deserve evaluation. Another option may be to use newer pharmacological agents specifically targeting neuropathic pains, such as gabapentin [21,24]. To our knowledge, there has been only one published report of the successful use of gabapentin in the management of post-thoracotomy pain [25]. Given the encouraging evidence for pain and discomfort after thoracic surgery resulting from neuropathic mechanisms [20], we are currently exploring the use of gabapentin for these patients.

The reduction of chronic pain after chest surgery by controlling early post-operative pain has been previously described [14]. The possibility of control of longer term paresthesia by early, aggressive initial post-operative management also seems to be a prospect for future study.

Inevitably, as with all investigations of new phenomena such as this, there are limitations to our study. First, experiences of pain and paresthesia are notoriously difficult to quantify and study. Currently, there are no well-established scoring systems for documenting paresthesia. This is in contrast to pain, where widely used and trusted systems such as the McGill Pain Questionnaire are available. In the absence of such scales, it is not easy to quantify the paresthesia reliably. In this study, we have relied heavily on the verbatim reports of the patients, and on simple measures such as a visual analog scale. Possibilities for future study include the use of more sophisticated quality of life measures such as the SF-36 questionnaire to document the effect of paresthesia on daily life.

Secondly, it is recognizably difficult to control the influence of the socio-economic and educational backgrounds of individual patients on their sensation of paresthesia. We have attempted to reduce the number influence of external variables by studying only patients with PSP who have undergone VATS pleurodesis during a relatively short 24 month time window. We realize that the pleurodesis may add another variable in the patients’ experience of any post-operative discomfort, and may arguably contribute in part to the paresthesia. However, we decided to study this group of patients as the technique of VATS pleurodesis in our institute is well-established and there were no variations in the procedure in all patients throughout the 24 month study period. VATS pleurodesis is also one of the most common operations performed by our unit, allowing the recruitment of adequate numbers of patients within a short period, and reducing the impact of patients forgetting their experiences of pain and paresthesia. We are now embarking on a prospective study to obtain a more conclusive tracking of the progress of the paresthesia over time than in our current study.

Finally, we acknowledge that a generally accepted definition of paresthesia is not available, and the definition in this study is necessarily arbitrary. It is entirely possible that the paresthesia described in this study may itself be a heterogeneous cocktail of pathologies and injuries.
Nonetheless, we believe that the recognition that post-VATS pain and discomfort is not a simple, homogeneous entity is a significant finding, and this may partially explain the observed difficulty in eradicating it with conventional strategies.

We would emphasize that the findings of our study do not argue against the proven advantages of VATS, and VATS strategies.

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total. However, the post-VATS paresthesia represents an area for improvements in practice to be made, and its identification is the first step in that direction.

References


