We report a case of single-incision bilateral partial lung resection using the subxiphoid approach. This approach requires a 3-cm incision in the abdomen, making it aesthetically favorable. In addition, it does not cause postoperative intercostal neuropathy, and postoperative pain is minimal because the intercostal space is bypassed. Moreover, this technique enables exposure to both lungs through a single incision and has potential for widespread use if maneuverability can be increased by improving the instruments used.

In single-incision endoscopic operations, an exclusive port is inserted into a single incisional wound, and the surgical procedure is performed using multiple forceps with bendable tips [1]. This procedure is not only minimally invasive but also aesthetically favorable. We previously reported a single-port thymectomy procedure in which the operation was performed through a 3-cm subxiphoid incision using the port and instruments for single-incision endoscopic operations [2]. Here we report a case of single-incision bilateral partial lung resection using the subxiphoid approach, similar to that used in our previous report.

Technique

We performed bilateral partial lung resection using single-incision endoscopic surgical intervention in a 60-year-old man with bilateral lung metastases from colorectal cancer (Fig 1). Informed consent was obtained from the patient for the procedure as well as for the presentation of the obtained clinical information. Tumors were preoperatively marked with a needle on computed tomographic scans to identify their location during the operation. Using general anesthesia, the patient was intubated with a double-lumen endotracheal tube, and artificial ventilation was applied. The patient was placed in the supine position with his legs spread, and the surgeon stood between the patient’s legs. First, a 3.0-cm transverse incision was made below the xiphoid process. The inferior side of the sternum was blindly dissected with fingers. A SILS port (Covidien, Mansfield, MA) was then inserted into the wound below the xiphoid process. The inferior side of the sternum was blindly dissected with fingers. A SILS port (Covidien, Mansfield, MA) was then inserted into the wound below the xiphoid process, and CO2 was insufflated at a pressure of 8 mm Hg. The SILS port has 4 insertion openings through which up to 4 ports of 5 to 12 mm can be inserted. A 5-mm rigid scope with a 30-degree angle was used during the procedure. In the left hand, the surgeon held a SILS CLINCH 36 cm (Covidien) designed for single-incision operations and in the right hand, either a LigaSure V (Covidien) or a Cherry Dissector (Ethicon Endo-Surgery, Cincinnati, OH). With these instruments, the surgeon dissected the thymus from the inferior side of the sternum to reach the chest cavity. The mediastinal pleura was then incised to enter the thoracic cavity. Next, the affected part of the lung was held with the bendable forceps inserted through the 5-mm port, and the lung was partially resected using an articulating surgical staple inserted through the 12-mm port (Fig 2). We tested for air leakage by infusing sterile distilled water into each thoracic cavity separately. Water should not be infused into both thoracic cavities at the same time because compression of the bilateral lungs may cause difficulty in maintaining ventilation. After 2 20F drains were inserted into the bilateral thoracic cavities through the port inserted into the incision, the port was removed and the incision was closed. Although bilateral lung metastasectomy was completed in 61 minutes, it took 122 minutes to complete the entire surgical procedure because of the time needed to set up the air leakage testing equipment. Blood loss was minimal. Chest drains were removed on postoperative day 1. No complications occurred during or after operation, and the patient was discharged 4 days later. Pain was mild, and analgesic administration became unnecessary 1 week after the surgical procedure.

Comment

The surgical technique in which the surgeon inserts a hand through a subxiphoid incision into the thoracic cavity to palpate a tumor while a thoracoscope is inserted from the side of the chest has already been reported [3]. This technique is used to palpate a tumor manually and thus requires both a large incision and intercostal port access in the side of the chest. Recent reports have also
described lobectomy through a single port in the side of the chest [4]. However, the intercostal approach from the side of the chest is always associated with persistent postoperative pain and intercostal nerve damage, even though it requires only a single incision.

In contrast, the subxiphoid single-incision approach described here requires a 3-cm incision in the abdomen, making it aesthetically favorable. In addition, it does not cause postoperative intercostal neuropathy [5], and postoperative pain is minimal because the intercostal space is bypassed. Moreover, this technique enables exposure to both lungs through a single incision. Thus, it may be useful for conditions such as bilateral metastatic pulmonary tumor or bilateral pneumothorax. Because palpation of the lungs is impossible using this approach, if the tumor is thought to be difficult to locate using endoscopy, it should be marked preoperatively on computed tomographic scans. Additionally, from an anatomic perspective, resection of the dorsal portion of the lungs, which is furthest from the xiphoid process, may be difficult. At present, the subxiphoid single-incision approach is indicated only for tumors located near the anterior surface of the lungs. Recently, use of the da Vinci Single-Site Instrumentation System (Intuitive Surgical, Sunnyvale, CA) was approved by the US Food and Drug Administration for use in laparoscopic cholecystectomy. With experience in both robotic operations and single-port operations, we are confident that improved operability achieved by the use of a sophisticated robotic system will make the subxiphoid approach an even more feasible approach for lung resection. A subxiphoid approach for lung resection appears to be less invasive than thoracoscopic operations from the side of the chest. Therefore, the present technique has potential for widespread use if maneuverability can be increased by making improvements to the instruments used.

References