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Clinical Analysis of the Treatment of Exudative Tuberculous Pleurisy with Central Venous Catheter Drainage

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ABSTRACT **Objective:** To evaluate the clinical effect of the treatment of exudative tuberculous pleurisy with central venous catheter drainage. **Methods:** 60 cases of exudative tuberculous pleurisy were divided into two groups. The treatment group was treated with central venous catheter drainage, while the control group was treated with multiple conventional thoracentesis. **Results:** The clinical effect of the treatment group was significantly higher in comparison to the control group ($p < 0.01$). The adverse reaction of the treatment group was significantly lower in contrast to the control group ($p < 0.01$). **Conclusion:** Application of central venous catheter drainage in the treatment of exudative tuberculous pleurisy revealed a positive effect, by showing less adverse reaction. Therefore, the treatment is worth to be promoted for clinical application.

KEYWORDS

Exudative tuberculosis pleurisy
Central venous catheter drainage
Conventional thoracentesis

1. Introduction

In order to explore the effective method for the treatment of exudative tuberculous pleurisy, the application of central venous catheter drainage and conventional thoracentesis for the treatment of exudative tuberculosis pleurisy had been compared in our department from September 2013 to February 2015. The report was as follows.

2. Materials and methods

2.1. General information

60 cases of patients with exudative tuberculous pleurisy who were treated in the tuberculosis department at our hospital were selected from September 2013 to February 2015 as the research subject. All the patients were diagnosed as exudative tuberculous pleurisy based on certain criteria such as the medical history, symptoms, signs, chest X-ray, chest CT, PPD skin test, tuberculosis antibody, pleural effusion routine and biochemistry and so forth. After B-ultrasound examination, the patients were displayed in the middle amount of pleural effusion. The patients were comprised of 35 male and 25 female. Their age was between 17 to 74 years old, with the mean age was 45.5. The patients were divided into two groups namely, treatment and control group. The two groups were statistically compared in terms of gender, age, pleural effusion volume and so on.

There was no significant difference in sex, age and the amount of pleural effusion between the two groups ($p > 0.05$).

2.2. Treatment methodology

The treatment group was treated with central venous catheter drainage. Generally patients were laid in a reverse sitting position in order to determine the optimal surface puncture position of B-ultrasound. It is crucial for the puncture to get into the deepest of intercostal pleural effusion from seventh to ninth of infrascapular line as the puncture point in to the affected side. The disinfection procedures were carried out in accordance to conventional skin disinfection methods such as usage of sterile gloves with a laying aseptic hole-towel and 2% lidocaine hydrochloride. The needle was punctured in perpendicular to the upper edge of the rib at the puncture point. The anesthetic procedure was conducted by inserting the needle into the chest cavity until it reached the pleura. If there was

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a breakthrough feeling occurrence and at the same time there was a liquid outflow during pumpback, it was the sign for the anesthesia needle to be pulled out. Then the needle with a Y type tube was punctured vertically into the chest cavity from the puncture point, meanwhile observing the liquid outflow during pumpback. Medical assistant guided along the Y type wire tube slowly into the chest for about 15 cm, and then the puncture needle was seceded. The wire tube was guided into the thoracic cavity to expand the skin, and then seceded for a while before the central venous catheter was slowly introduced into the chest cavity along the guided wire. Generally in order to determine the pleural effusion outflow, the entering of the tubes into the chest was approximately 10–15 cm in length, and then the guided wire was seceded and the tube was closed. In order to fix the catheter with the applicator, the end of catheter was link with drainage bag, with the switch-on mode, and started the drainage process. The first drainage volume was less than 600 mL. However, daily drainage volume was less than 1000 mL soon after the first drainage process. If the pleural effusion could not be released, the pleural effusion disappeared or the amount of fluid became less after B-ultrasound examination was conducted. If the syringe was connected to the drainage tube, the pleural effusion could not be drawn out. Therefore, it was time to pull out the catheter [1,2].

The control group was treated with conventional thoracentesis. After the conventional thoracic puncture under B-ultrasound examination, syringe with the specification of 50 mL was used in order to pump the liquid 2–3 times a week, in which, each puncture was located by B-ultrasound. The first drainage volume was less than 600 mL. Soon after that, the drainage was less than 1000 mL. The process was not finished until it could draw out the pleural effusion.

2.3. Observation index

Statistical analysis of the two groups were conducted by observing several parameters which include the absorption time of the pleural effusion, increment of pleural thickness, the remission time of panting, and length of stay. Moreover, it was carried out in order to obtain the clinical comparison between the two groups of complications occurrence.

2.4. Efficacy evaluation criteria

Curative signs: Clinical symptoms disappeared and the pleural effusion completely disappeared. Excellence curative signs: The pleural effusion completely disappeared, lung functions recovered, and the costophrenic angle was visible. Effective curative signs: The pleural effusion was basically absorbed, with the liquid in the dark area was in the range of 0.5~2.0 cm and the costophrenic angle were slightly blunt. Invalid curative signs: None of the above criteria was fulfilled. Total effective rate (%) = (Excellence + Effective)/Total number of cases × 100%.

2.5. Statistical analysis

In this study, all the data were processed by using SPSS 18.0 statistical software, with "($x + s$)" term to express the measurement data. T test was used for the comparison between the groups, and chi square test was used for the comparison of total effective rate. $p < 0.01$ indicated that it was statistically significant.

3. Results

3.1. Clinical curative effect

Table 1 showed the comparison of clinical efficacy between the two groups. The clinical efficacy of the treatment group was significantly higher in contrast to the control group ($p < 0.01$). The crucial parameters in the pump volume of the two groups which includes pleural thickness, length of stay, and pulmonary function in the drainage process were significantly higher than that in the chest group. It was suggested that the method was beneficial for the drainage of pleural effusion. The pleural thickness was significantly lower in contrast to the puncture group ($p < 0.05$), while the average length of staying in the hospital was significantly decreased.

Table 1. Comparison of efficacy between the two groups (n).

Group	Cases	Cure	Effective	Invalid	Total effective rate (%)
Treatment group	30	19	10	1	96.7%
Control group	30	13	10	7	76.7%
p value					< 0.01

3.2. Adverse reactions effect

The comparison of adverse reactions between the two groups was shown in Table 2. The adverse reactions for the treatment group were less than the control group, and showed statistical significant difference ($p < 0.01$).

Table 2. Comparison of adverse reactions between the two groups (n).

Group	Cases	Pleural reaction	Pectoralgia	Infection	Total (%)
Treatment group	30	1	1	1	10.0%
Control group	30	5	5	5	50.0%
p value					< 0.01

The incidence of pectoralgia, infection and pleural reaction in the treatment and control group was 3.3% and 16.7%, respectively. The incidence of pneumothorax and pleural reaction in the puncture group was higher as compared to the drainage group. The adverse reaction in the two groups was mild, and all of them showed improvement after the symptomatic treatment. All the selected cases in the drainage group were well tolerated with urokinase,

except for one patient who was experiencing mild pain after the injection. However, there was no special treatment and spontaneous remission, and it would not affect the continuity of the treatment. The clotting time of the prothrombin and fibrinogen of the patients in the two groups revealed no differences either before or after treatment [3].

4. Discussions

Exudative tuberculous pleurisy is the pleural inflammation which is caused by mycobacterium tuberculosis and its metabolites by entering into the hypersensitive state pleural cavity of the body. In recent years, the incidence of exudative tuberculous pleurisy has reinclined with the rapid rise of tuberculosis. In tuberculosis pleural effusion, the quantity of serum fibrin was high in amount, hence allowing the formation of pachynsis pleurae adhesions [4]. Fibrin in tuberculosis pleural effusion were readily deposited in the pleural, hence forming the fibrous moss in order to close epipleural ostium lymphaticum, to thicken the absorbing film, and to hinder the resorption of pleural effusion. If the pleural effusion persisted for a long time in the chest, the absorption function would become bad. Concurrently, it also increased the deposition rate of fibrin, so that the pleura became thicker and forming a vicious circle. The source of mycobacterium tuberculosis infection which causes exudative tuberculous pleurisy mainly includes: (1) Direct spreading: Pulmonary tuberculosis focus, dorsal phthisis, paravertebral abscess and thoracic tuberculosis could directly spread to the pleura; (2) Hematogenous dissemination: The bacteria of tuberculosis could represent themselves at any part of the body; (3) Lymphatic dissemination: Hilus of lung or tuberculosis of mediastinal lymph nodes, owing to lymphadenopathy was affected by lymphatic drainage process which lead to countercurrent of the lymph and pleura [5]. According to the domestic reports, the tuberculosis pleural effusion accounts for about 10% of tuberculosis. Exudative tuberculous pleurisy is mainly contributed to pleural allergic reaction, due to the high content of pleural effusion protein and is relatively easy to cause pleural adhesion, separation and inclusion, and affecting the lung function of the patients. Therefore, in the case of regular anti-tuberculosis treatment of exudative tuberculous pleurisy, pleural effusion should be either drained as soon as possible or inserted the tube for intercostal drainage in principle [6].

There are mainly three methods for the treatment of exudative tuberculous pleurisy namely, (1) Relieve symptoms; (2) Elimination of the *mycobacterium tuberculosis* and prevention of the disease occurrence; (3) Prevention of the formation of fibrothorax. The specific measurements were through regular anti-tuberculosis treatment, hormone and pleural effusion drainage treatment. Pleural effusion drainage treatment was the main measurement for male, which was conducted by controlling the pumping speed in order to drain once in a larger volume. Nonetheless, there were a lot of adverse reactions with low effective rate and other characteristics which sometimes reduplicated thoracentesis and subsequently contributed to patients' intolerance psychologically and physiologically. In contrast to the traditional method of thoracentesis, the treatment of exudative tuberculous pleurisy with central venous catheter drainage has several obvious advantages. (1) Operation became simpler except that during drainage, two persons were required to lay the catheter for the first time. After that, it can be handles by one person in order to complete the process quickly. This method significantly reduced the labor intensity of medical personnel and reserved the manpower. Besides, they have more time for other clinical works; (2) The number of puncture was reduced, therefore lessen the pain of patients in case of the patient needed to repeat the process again; (3) Central venous catheter has a small and soft diameter, hence the stimulation of the pleural was also small. There was no obvious pectoralgia, therefore, the patients had the likelihood to accept it easily; (4) Avoidance of the reduplicated puncture, which usually traumatized the patients. Complications such as infection, aerothorax, pleural reaction and so forth were lessened. The results of the treatment group showed that the clinical curative effect was significantly higher in comparison to the control group ($p < 0.01$). The adverse reaction of the treatment group was less than that of the control group ($p < 0.01$). It indicated that application of central venous catheter drainage in the treatment of exudative tuberculous pleurisy portrayed a favorable curative effect with less adverse reaction. It is worth to be promoted into the clinical application. Tuberculosis pleural effusion is a common clinical disease and the pleural effusion often oppresses lung which limits the activity of the diaphragm, reduces respiratory area and lung capacity. Therefore, reduction of the pleural effusion and the complications incidence were mainly the key objectives for most of the clinicians. Clinical researches confirmed that central venous catheter closed drainage of thoracic cavity possessed high application value in treating tuberculous pleural effusion. The study herein showed that absorption time of the pleural effusion in the treatment group was shorter than that in the control group. The pleural thickness, the remission time of panting, and duration of hospitalization for the treatment group was shorter in contrast to the control group. The total effective rate for the treatment of tuberculous pleural effusion was higher in the treatment group as compared to the control group. The incidence of complication was lower than that of the control group ($p < 0.05$). A few relevant studies also showed that the traditional thoracentesis needed to be repeated that make the patients even suffer. If the amount of pleural effusion was relatively small, pneumothorax and pleural reaction were rather easy to be eliminated. Central venous catheter closed drainage of thoracic cavity just need through checking of the chest once and the patients may experiencing less pain and are free

to have an activity concurrently. Central venous catheter closed drainage of thoracic cavity had less complications of pneumothorax and pleural reaction, which showed its high efficacy effect. The results of this study confirmed that the clinical effect of central venous catheter closed drainage of thoracic cavity to treat patients with pleural effusion was effective in comparison to the traditional paracentesis of chest provided that it should be strictly control during surgical process in order to avoid sustained shock, infection of puncture site, especially for the patients with severe disturbance of blood coagulation who were treated using this method. Additionally, the process of drainage should be in a uniform and slow speed with the control drainage speed of <50 mL/min and observed the patient's condition continuously. When the patient appears to be sweating, having heart palpitations, face turned pale, experiencing dizziness and other adverse reactions, the drainage process should be stopped immediately and continued with symptomatic treatment. In summary, central venous catheter closed drainage of thoracic cavity can be used in the treatment of pleural effusion patients with the disappearance time of effusion was relatively short, and the incidence of complication was low. Moreover, the cost was lesser and duration of hospitalization was shorter with high efficacy effect. Therefore, it is worth be promoted further into the clinical applications.

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