

Original Research Article

Comparative study between indwelling pleural drain and intercostal drainage followed by pleurodesis in management of malignant pleural effusion

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ABSTRACT

Background: Malignant pleural effusion is a major cause of morbidity in lung cancer patients. Management involves repeated pleural aspirations or persistent intercostal drainage (ICD) tube. Using an indigenous method of putting ICD tube of smaller size with subcutaneous tunnelling allows draining fluid from lungs easily and painlessly when needed avoiding the need for repeated injections and chest tube insertion.

Methods: In this prospective, 48 months study, 100 patients of malignant pleural effusion were included in the study and half of them were treated with intercostals drainage followed by pleurodesis and the remaining half were treated with a indwelling pleural catheter (IPC). The end points taken were hospital bed days, complications, cost and quality of life insertion.

Results: In the IPC group the average baseline dyspnoea score (visual analogue scale) of the patients was 61.23 ± 22.10 and at 6 months it was 5.65 ($p < 0.05$). In ICD group average baseline dyspnoea score was 64.44 ± 27.40 and at 6 months it was 14.09 ($p < 0.05$). In IPC group the average baseline quality of life score was found to be 41.18 ± 9.40 and at 6 months it was 69.87 ($p < 0.05$). In ICD group average baseline quality of life score was found to be 43.21 ± 7.84 at 6 months it was 58.88 ($p < 0.05$). In terms of hospital readmission around 8 patients (16%) belonging to IPC group needed it and in ICD group 17 patients (34%) needed it. The commonest complication found in IPC group was catheter blockage and it was seen in 13 patients (26%). In ICD group the commonest complication was the need for repeat drainage seen in 12 patients (24%).

Conclusions: Indwelling pleural catheter is a low cost, easily available and successful alternative option to intercostals drainage in patients having persistent malignant pleural effusion and it provides a better quality of life to patients.

Keywords: Indwelling catheter, Intercostal drainage, Malignant pleural effusion, Indwelling pleural drain

INTRODUCTION

Recurrent malignant pleural effusion is a known cause of increased mortality, decreased functional status and a harbinger of poor quality of life if not managed promptly and adequately with a median survival of 3 months.¹ The methods to manage it include mechanical drainage

causing pulmonary decompression and hence relieving dyspnea with improved quality of life. The mechanical drainage is done by repeated pleurocentesis, repeated ICD insertion and chemical pleurodesis by talc, tetracycline, bleomycin, thoracoscopy, talc insufflations and video assisted thoracic surgery.²⁻⁵ All of these methods increase morbidity and cost to the patient due to repeated procedures and hospitalization or are advanced

procedures not available in every institute especially in third world countries which lack the technical knowhow and trained interventionalists despite having a huge burden of such patients.⁶⁻¹⁰ In recent times chronic indwelling pleural catheter has gained as a safe and effective method to relieve dyspnea, maintained quality of life and reduced the need for hospitalization in patients with malignant pleural effusions.¹¹ A modification of the above method with indwelling pleural drain provides a low cost alternative with no additional training required by the respiratory physician have been used by the authors in 100 patients from June 2012 to July 2016 with promising results.¹²

METHODS

All patients had proven recurrent malignant pleural effusion (MPE) diagnosed by cytologic examination of the fluid in a diagnosed case of malignancy. 50 cases were taken in the first arm in which per cutaneous (IPC) indwelling pleural drain was put and 50 cases of chest tube (ICD) in the second arm.

Patients in whom previous attempts at pleurodesis have been made within the last 56 days on the same side as the effusion requiring management, patients with previously documented adverse reaction to talc or lidocaine, patients with bleeding disorders and other contraindications to IPC were excluded from the study.

Subcutaneous IPC patients

Between June 2012 to July 2016, 50 patients were treated at the MM Institute of Medical Science and Research, Ambala with an intercostal tube in percutaneous (IPC) position of small lumen (men 39, women 11; mean age 56.4 years). 48 had one pleural drain placed, 2 had two pleural drain placed. Pleurodesis and chest tube removal was done when drain was less than 100 cc for two consecutive days.

Chest tube patients (ICD)

Between June 2012 to July 2016, 50 patients were treated at the MM Institute of Medical Science and Research, Ambala for treatment of MPE with tube thoracostomy and pleurodesis (44 men, 6 women; mean age 59.7 years). Sclerosis was obtained with betadine or talc. Chest tubes were removed when drainage was less than 100 cc in a 48-hour period.

Treatment groups

Chest tube in patients (ICD)

After appropriate evaluation, 28F chest tubes were placed in a standard manner at the bedside using local anesthesia. When drainage had dropped to less than 100 cc/24 h, sclerosis with talc or or betadine was performed and the patient was discharged home 4 to 8 hours later.

Indwelling catheter patients (IPC)

Most patients had the PC placed under local anesthesia in a clean procedure room in the outpatient clinic.

Technique of IPC Indwelling pleural drain placement

After detailed informed consent, the site of ICD insertion site was marked by ultrasonography in the mid axillary line. The skin was thoroughly cleaned with betadine and methylated spirit. A second point was marked 5 cm behind and above the first point and lignocaine 2% was given liberally at the point of ICD insertion and subcutaneously in the line between these two points. Two subcutaneous nicks were given, the first 0.5 cm behind the point of ICD insertion and the second at the second point behind and a subcutaneous tunnel was created by straight artery forceps between the two points. An 18 Fr rhemsons ICD tube was taken and passed through the subcutaneous tunnel and pulled out with the artery forceps. A nick was given and the front end was inserted in the chest wall as a normal ICD insertion. The rear end of the tube was cut and used as an air tight cap after reversing it (alternately needle cap can also be used). One stitch was placed at ICD site and the other at the second point. The ICD was bent and dressing applied in two layers with the upper layer in two parts so that whenever drainage was to be done, the patient removed the distal part of dressing above and connected to a bag and sealed the tube with the cap after drainage of fluid. The patient was mobile without any need for carrying the ICD bag with ICD *in situ* continuously and remained comfortable with the tube for 6 months or till the end of life. During this period the patient was called for follow up every 15 days and sterile dressing was done. No complication was encountered during the above said period.

Follow-up of IPC Patients

After placement of the catheter, patients and caregivers were instructed on self-drainage of their MPE. Typically, patients would drain their effusion at home every other day. When scant or no fluid was obtained on three consecutive attempts, the patient presented to the hospital for pleurodesis and removal of the catheter. Patients were routinely evaluated in the hospital at 15 days interval while the catheter was in place. After removal of the catheter, the patient was discharged to the care of their regular physician.

Statistical analyses

All the results are expressed in percentages or in Mean±SD. Values of p <0.05 are considered to be statistically significant.

RESULTS

In Our study out of the 50 patients in the IPC group, 11(22%) were females and 39 (78%) were males. Almost

similar trend was seen in the 50 patients of ICD group where 6 (12%) were females and 44 (88%) were males as shown Table 1.

Table 1: Gender distribution of patients studied.

| Gender | Groups | | Total (%) |
|-----------------------|-----------------|-----------------|------------------|
| Gender | IPC (%) | ICD (%) | |
| Female | 11 (22) | 6 (12) | 17 (17%) |
| Male | 39 (78) | 44 (88) | 83 (83) |
| Total | 50 (100) | 50 (100) | 100 (100) |
| p value =0.286 | | | |

The mean age group of the patients taken in our study was 56.4±7.7 years in IPC group and 59.7±6.30 years in the ICD group. The average dyspnoea score (visual analogue scale) of the patients was 61.23±22.10 in IPC group and 64.44 ±27.40 in ICD group. The average Quality of life score was found to be 41.18±9.40 in 50 patients of IPC group and 43.21±7.84 in 50 patients of ICD group as given in Table 2.

Table 2: Baseline dyspnoea and quality of life score.

| Variables | Groups | Mean | SD | p- value |
|-----------------------|--------|-------|-------|----------|
| Age (years) | IPC | 56.40 | 7.70 | 0.198 |
| | ICD | 59.70 | 6.30 | |
| Dysnoea score (VAS) | IPC | 61.23 | 22.10 | 0.237 |
| | ICD | 64.44 | 27.40 | |
| Quality of life score | IPC | 41.18 | 9.40 | 0.431 |
| | ICD | 43.21 | 7.84 | |

Table 3: Comparison of dyspnoea score (VAS) on follow up in IPC and ICD patients.

| Dyspnoea score (VAS) ¹³ | Groups | Mean | SD | p- value |
|------------------------------------|--------|-------|-------|-----------------|
| 6 weeks | IPC | 23.11 | 11.10 | 0.56 |
| | ICD | 25.08 | 12.43 | |
| 3 months | IPC | 11.23 | 6.54 | <0.05 |
| | ICD | 19.21 | 7.21 | |
| 6 months | IPC | 5.65 | 2.32 | <0.05 |
| | ICD | 14.09 | 5.46 | |

The baseline dyspnoea score was found to be 61.23 in IPC group and 64.44 in the ICD group. On follow up at 6 weeks the change in dyspnoea score was not statistically significant (p =0.56). At 6 months follow up we find that the dyspnoea score in IPC group patients was 5.65 and in ICD group patients it was 14.09. It was also found to be statistically significant (p <0.05). The results showed that

patients belonging to IPC group showed a better symptomatic relief on follow up at 6 months in terms of dyspnoea score when compared to ICD patients as shown in Table 3.

The baseline quality of life (QOL) score was found to be 41.18 in IPC group and 43.21 in the ICD group. On follow up at 6 weeks the change in QOL score was statistically significant (p <0.05) with both the group of patients showing an improvement in QOL score. At 6 months follow up we find that the QOL score in IPC group patients was 69.87 and in ICD group patients it was 58.88. It was also found to be statistically significant (p <0.05). The results showed that patients belonging to IPC group showed a better Quality of life on follow up at 6 months in terms of QOL score when compared to ICD patients.

Table 4: Comparison of quality of life on follow up in IPC and ICD patients.

| Quality of life ¹⁴ | Groups | Mean | SD | p- value |
|-------------------------------|--------|-------|-------|----------|
| 6 weeks | IPC | 57.63 | 13.20 | <0.05 |
| | ICD | 49.98 | 11.98 | |
| 3 months | IPC | 63.43 | 6.54 | <0.05 |
| | ICD | 54.34 | 7.21 | |
| 6 months | IPC | 69.87 | 2.32 | <0.05 |
| | ICD | 58.88 | 5.46 | |

In terms of hospital readmission around 8 patients (16%) belonging to IPC group needed it and in ICD group 17 patients (34%) needed it. This shows that ICD patients have a greater chance of requiring readmission when compared to IPC patients as shown in Table 5.

Table 5: Hospital readmission rates in IPC and ICD patients.

| Hospital readmission (1 years) | Groups | | Total (%) |
|--------------------------------|-----------------|-----------------|------------------|
| | IPC (%) | ICD (%) | |
| Yes | 8 (16) | 17 (34) | 25 (25) |
| No | 42 (84) | 33 (66) | 75 (75) |
| Total | 50 (100) | 50 (100) | 100 (100) |
| p- value <0.05 | | | |

The commonest complication found in IPC group was catheter blockage and it was seen in 13 patients (26%) and none of the patients in IPC group needed repeat drainage. Cellulitis was seen in 5 patients (10%) and pleural infection in 4 patients (8%) of IPC group. In ICD group the commonest complication was the need for repeat drainage seen in 12 patients (24%). Catheter blockage and pleural infection was seen in a patient each and cellulitis was seen in 3 patients of ICD group.

Table 6: Complications seen in IPC and ICD patients.

| Complications | Groups | | Total (%) | p-value |
|-------------------|---------|--------|-----------|---------|
| | IPC | ICD | | |
| Pleural infection | 4 (8) | 1 (2) | 5 (5) | 0.362 |
| Cellulitis | 5 (10) | 3 (6) | 8 (8) | 0.710 |
| Catheter blockage | 13 (26) | 1 (2) | 14(14) | <0.05 |
| Repeat drainage | 0 | 12(24) | 12 (12) | <0.05 |

DISCUSSION

Pleurodesis has been used traditionally for management of malignant pleural effusions, but it is associated with a number of problems.¹⁵ A very large randomized trial in pleural disease (n = 486), 5 talc (poudrage or slurry) pleurodesis indicated that only about 75% of malignant pleural effusions patients at 1 month and around 50% by 6 months had significant fluid control. In a subset of patients with conditions like trapped lung in which the lung does not expand and hence pleural approximation cannot occur, pleurodesis is useless. Few trials have also shown that talc induces lung and systemic inflammation and killed 2.3% of patients in a cancer and leukemia study through talc-induced respiratory failure.^{16,17} This acute lung injury can be decreased by using large particle size talc preparations, such products are imported in India and one small vial costs around 5000 rupees and is not available in all the states.¹⁸ The shortcomings of pleurodesis in a selected set of patients can be overcome by introduction of indwelling pleural catheters which allow fluid evacuation from a single minimally invasive procedure. It is associated with minimal complication as pain; however, a systematic review including 1370 patients has confirmed that serious complications were uncommon (3%).¹⁹ Various other studies have demonstrated safety records in patients undergoing chemotherapy and local radiotherapy with indwelling pleural catheters *in situ* and found them to be quite safe.^{20,21} Indwelling pleural catheters is generally accepted for treatment of malignant pleural effusions patients in whom pleurodesis has failed or is contraindicated (especially trapped lungs).²² However, its use in India is limited by the fact of decreased availability and cost. The priority for most malignant pleural effusions patients are alleviation of dyspnea and optimization of quality of life (the principle end points for aforementioned European multicenter trials) while avoiding hospital admissions.

Therefore, in an Indian context the primary aim of malignant pleural effusions management is to improve dyspnea and quality of life, with minimal intervention and hospitalization at a less cost without compromising on the safety. Using a normal portex intercostals drainage tube which is easily available, highly economical, with pulmonologists already well versed with its use (and hence eliminates the need for learning curve for indwelling pleural catheter) and equally efficacious is the answer of choice to selected patients of malignant pleural

effusions who are not fit for pleurodesis, want to remain mobile and social, want to decrease morbidity and cost and prefer home management instead of hospital admissions. . Since the Indigenous Indwelling pleural catheter made of portex intercostal drainage tube is cheaply available (2\$) and also does not need prolonged hospital admission is a very cost effective method of management of malignant effusion patients as it cuts down the expenditure of hospital stay and also other medications and decreases morbidity thereby improving the quality of life of patients at a very affordable cost.

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