Evaluation of Povidone-Iodine in Pleurodesis of Malignant Pleural Effusion

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Abstract

Background: Malignant pleural effusion (MPE) is a condition that malignant cells are presented in the pleural fluid. 10% povidone-iodine in pleurodesis is one of (MPE) treatment options.

This study aims to evaluate the safety, efficacy and the success rate of 10% povidone-iodine in pleurodesis procedure through thoracostomy by conducting; the assessment of radiological and clinical outcome after using of povidone –iodine as a chemical pleurodesis agent.

Randomized clinical trial, was carried out on 18 cases at Thoracic Surgery Department, Abuslem Trauma Center, Tripoli 2020 - 2021, all patients who underwent pleural drainge and received bedside mixture of 20 ml of 10% topical solution of povidone-iodine and 80 ml of normal saline, was Instilled into the pleural cavity through pleural catheter and then, the tube was clamped for 1 hour.

In the absence of excessive fluid drainage (> 250 mL/ day) and no fluid collection in chest x ray, the pleural catheter removed within 24-48 hours of sclerosant administration pleurodesis with 10% povidone-iodine. After pleurodesis, all patients were assessed via chest X-ray (CXR) after procedure, and at one month.

Data collected throughout history, basic clinical examination, laboratory investigations and outcome measures coded, entered and analyzed using Microsoft Excel software.

Results: revealed that early response was 72.2% complete, partial in 16.6%, and failure 11.1%, major complication was nausea.

We concluded that povidone-iodine is a safe and effective agent with minor side effects in pleurodesis and treatment of MPE and proposed povidone-iodine as a proper, accessible, and low-cost alternative sclerosing agent.

Keywords: pleurodesis, povidone-iodine, malignant pleural effusion.

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Introduction.

The pleura are the serous membrane that covers the lung parenchyma, the mediastinum, the diaphragm, and the rib cage. Divided into the visceral and parietal pleura. The parietal pleura line the inside of the thoracic cavities. The visceral and the parietal pleura meet at the lung root.

Pathophysiology of pleural effusion

A. Increased pleural fluid formation:
I. Increased interstitial fluid in the lung:
II. Increased intravascular pressure in pleura:
III. Increased permeability of the capillaries in the pleura:
IV. Decreased Oncotic Pressure Gradient:
V. Presence of Free Peritoneal Fluid or Disruption of the Thoracic Duct or an Intrathoracic Blood Vessel:
B. Decreased pleural fluid absorption:
I. Obstruction of the lymphatics draining the parietal pleura.
II. Elevation of systemic vascular pressures.

Epidemiology: In a post -mortem autopsy study of 191 patients who died with malignancy, pleural effusion was present in 16%. While any carcinoma can metastasize to the pleura, lung carcinoma is the most common malignancy followed by breast cancer and Lymphoma to cause pleural effusions .Malignant causes should be excluded firstly in the list of differential diagnosis in patients diagnosed as exudates.

Imaging: Although standard chest radiographs can detect as little as 50 mL of pleural effusion on a lateral view, they provide only suggestive findings for the diagnosis of MPE (figure 1). A massive effusion increases the probability of a malignant etiology and commonly produces a meniscus sign with fluid tracking up the lateral chest wall, a shift of the mediastinum to the contralateral side, and an inversion of the diaphragm (Qureshi and Gleeson, 2006).

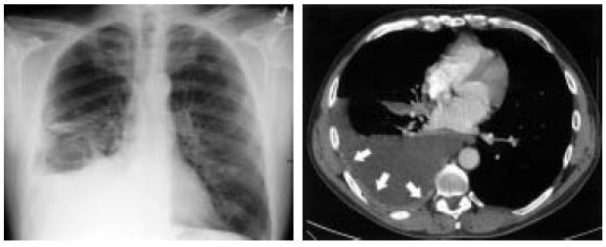

Figure (1): Right, Contrast-enhanced computed tomogram with mediastinal windows showing a right pleural effusion with irregular thickening of the parietal pleura (arrows). Computed tomography–guided pleural biopsy revealed metastatic renal cell carcinoma.

Treatment options for malignant pleural effusion (MPE) are varied and often tailored to the clinician's specialty and expertise, the patient's physical performance status, hospitalization status, and individual desires (Musani 2009).

They include repeat thoracentesis, tube thoracostomy with drainage and sclerosis with chemical sclerosant agents, chronic indwelling pleural catheter, intrapleural or systemic chemotherapy, thoracoscopy with drainage and talc insufflation, and pleurectomy (Putnam, 2007).

Povidone-iodine is a topical antiseptic agent that consists of iodine as an active ingredient, which is absorbed from mucosal surfaces and increases serum iodine concentration. Iodine can be absorbed by the thyroid gland and is excreted in the body. The main side effect of betadine injection in pleural cavity is mild pain Neto et al. reported in 16% of their patients. In a similar study, Caglayan et al. in Turkey found chest pain in 16.2% of cases, fever in 6.9%.

Usage of topical povidone-iodine and other iodine-base contrast agents can cause thyroid dysfunction. Increase in serum level of exogenous iodine not only can inhibit thyroid hormone synthesis but also can cause thyrotoxicosis in some patients.

Mode of action: It is used in pleurodesis (fusion of the pleura to achieve adhesion between parietal and visceral pleurae). For this purpose, povidone-iodine is equally effective and safe as talc, and may be preferred because of easy availability and low cost (Agarwal et al., 2012).

Contraindications: PVP-I is contraindicated in patients with hyperthyroidism (overactive thyroid gland) and other diseases of the thyroid, after treatment with radioiodine, (Jasek, 2007). Pain had already been reported as a complication of pleurodesis with iodopovidone as well as with other sclerosing agents (Andrade-Neto et al., 2010).

Hypotension has already been reported after iodopovidone pleurodesis. Thyroid function is a concern when using iodine therapies and whether iodopovidone pleurodesis interferes with this function is still a matter of debate (NCI Guidelines for Investigators, 2013).

Table (1): Normal composition of pleural fluid

Volume	0.1-0.2mL/Kg
Cells/mm2	1000-5000
% mesothelial cells	3-70%
% monocytes	30-75%
% lymphocytes	2-30%
% granulocytes	10%
Protein	1-2gm%
% albumin	50-70%
Glucose	= plasma level
LDH	<50% of plasma level

Methods.

Patient and collection of samples.

In order to fulfill the objectives of this study, the following techniques were followed: Technical design, Study design, and a randomized clinical trial.

The study was carried out at Thoracic Surgery Department, Abuslem Trauma Center,Tripoli.. Jan 2020 until Nov. 2021.

Target population, inclusion criteria: Recurrent malignant pleural effusion. Evidence of complete expansion of lung after drainage of fluid.

Exclusion criteria: Patients with a history of cardiac disease. Loculated effusions. Abnormal thyroid function test. Incomplete lung re-expansion after chest tube or pleural catheter insertion.

Post-procedure abnormal thyroid function tests can be the indicators of role of iodine on thyroid gland, due to pleurodesis with povidone-iodine.

Lidocaine (3 mg/kg; maximum 250 mg) was administered intrapleurally immediately prior to sclerosant administration, a premedication was considered to alleviate anxiety and pain associated with pleurodesis (pethidine 50 mg iv/im)

A mixture of 20 mL of 10% topical solution of povidone-iodine and 80 mL of normal saline ,was Instilled into the pleural cavity through pleural catheter and then, the tube was clamped for 1 hour, Patient rotation is not necessary after intrapleural instillation of sclerosant.

In the absence of excessive fluid drainage (> 250 mL/ day) and no fluid collection in chest x ray, the pleural catheter removed within 24-48 hours of sclerosant administration.

After pleurodesis, all patients were assessed via chest X-ray (CXR) after procedure, and at one month.

Statistical analysis.

Result of this study were analyzed using SPSS version 20 software. P-values less than 0.05 were considered statistically significant.

Results and

Data collected throughout history, basic clinical examination, laboratory investigations for 18 patients who are chosen according to iclusion and exclusion criterias. And outcome measures coded, entered and analyzed using Microsoft Excel software Results,

Table (2): Age and sex distribution among studied group (N=18)

		Age	
Median (Range)		57.5 (25-72)	
		N	%
Sex	Female	6	33.33%
	Male	12	66.66%
	Total	18	100.0

Table (3): CO-morbidity distribution among studied group (N=18)

		N	%
Chronic illness	NO	7	39%
	DM	3	16.6%
	DM & HTN	5	27.7%
	HTN	3	16.6%
	Total	18	100.0

39% were with no chronic illness and 61% with chronic illness.

Table (4): Symptoms distribution among studied groups

		N	%
Dyspnea	No	2	11.1
	Yes	16	88.8
Cough	No	6	33.3
	Yes	12	66.6
Chest pain	No	14	77.7
	Yes	4	22.2
	Total	18	100.0

Dyspnea was in 88.8% and cough in 66.6% and chest pain 22.2%

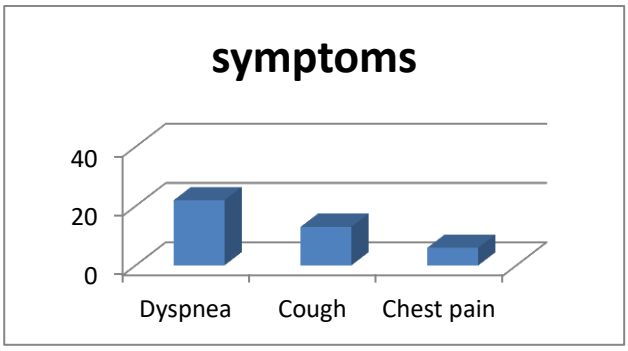

Figure 2 Symptoms distribution among studied groups.

Table (5): Cancer type distribution

		N	%
Cancer type	Breast	5	27.7
	Colon	2	11.1
	Lung	7	38.8
	Lymphoma	2	11.1
	Renal cell	1	5.5
	Prostate	1	5.5
	Total	18	100.0

Highest was lung followed by breast and colon.

Table (6): Characters of effusion distribution

		N	%
Character	Hemorrhagic	5	27.7
	Sero- sanginous	4	22.2
	Serous	9	50
Side	Left	5	27.7
	Right	13	72.2
	Total	18	100.0

50% had Serous, Sero- sanginous in 22.2% and 27.7% were Hemorrhagic, regarding site right 72.2% and left 27.7%.

Table (7): Adverse effects and Complication distribution

		N	%
Fever	No	13	72.2
	Yes	5	27.7
Thyroid changes	No changes	18	100
Need analgesia	No	10	55.5
	Yes	8	44.4
	Total	18	100.0

Major complication or adverse effect was need analgesia with 44.4% followed by fever 27.7%

Table (8): Hospital stay distribution among studied group

	Hospital stay
Median (Range)	2.0 (1-3)

Hospital stay was distributed as 1.87±0.68 with minimum 1 and maximum 3

Table (9): Response, follow up and other complication distribution

		N	%
Response	Complete	13	72.2
	Failure	2	11.1
	Partial	3	16.6
	No	9	50.0
Other complicatio n%	Dizziness	2	11.1
	Dyspnea	1	5.5
	Nausea	5	27.7
	Nausea and dizziness	1	5.5
CXR	Complete inflation	8	44.4
	Failure	2	11.1
	Partial	8	44.4
	Not	3	16.6
Follow up	Success	15	83.3
	Total	18	100.0

Discussion

Malignant pleural effusion (MPE) arises in advanced-stages of malignancies and frequently heralds a poor prognosis; most patients with MPE are symptomatic. The most common symptom is exertional dyspnea. Most patients undergo chemotherapy or local treatments to palliate symptoms such as dyspnea, cough & chest pain, to improve quality of life, however, when pleural effusion persists or reaccumulates after chemotherapy, Instilling of sclerosing agents into the pleural cavity (pleurodesis) procedure. 64% complete, partial in 28%, and failure 8%, are accepted results compared to other studies.

The results of this study suggest that povidone-iodine is a safe and effective agent with minor side effects in pleurodesis and treatment of MPE and proposed povidone-iodine as a proper, accessible, and low-cost alternative sclerosing agent.

Barriers and limitations of this study:

Lack of cooperation of some patients who refused to participate, Long time was needed to convince patients to participate in this study. Difficult in follow up the participants after the procedur. Drop out of some patients.

Conclusion.

MPE is a common complication in advanced stages of many malignancies. Common strategy to address this problem includes frequent thoracentesis through thoracostomy tubes or pleural catheters with or without pleurodesis that can effectively relieve the respiratory symptoms, in most patients with MPE, palliative treatment necessitates pleurodesis with sclerosing agents.

Chemical pleurodesis is one of the best options for the treatment of patients with refractory MPE and recurrent pleural effusions. The main question is the choice of the sclerosing agent, which is not only determined by the efficacy of the chemical agent but also by its safety, availability, cost, ease of use, and number of administrations to achieve a complete response, since there is no general consensus on the currently accessible best sclerosing agent for pleurodesis.

The aim of the study was to evaluate the safety, efficacy and the success rate of 10% povidone-iodine in pleurodesis procedure.

Regarding the Response, follow up and other complication distribution the response was 64% complete partial in 28% and failure 8%.

Major complication or adverse effect was need analgesia with 65% followed by fever 25%.

Recommendations:

Repeat the present study in different parts and another hospital in Libya and on large scale of populations to emphasize our conclusion

A person-centered care should be created when dealing with a patient through active listening to the patient's story. The patient should be considered as an active partner through the process of surgical care

Health care providers should insist on collaboration between them and the patient.

The health care provider should be the only source of trusted information. Assessment of the quality of life by health professionals should be an integral part of the patients' treatment.

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