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Original Research Article

Percutaneous Sclerotherapy of Cystic Lesions at Kenyatta National Hospital: Indications, Outcomes, Efficacy, and Complications

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Abstract: ***Background*:** Percutaneous sclerotherapy is a minimally invasive treatment for cystic lesions and has emerged as a preferred alternative to traditional surgical methods due to its faster recovery times and lower complication rates. A sclerosing agent is instilled into the lesion causing cyst wall inflammation and lesion shrinkage. It has a significant role in managing cystic lesions, with better health outcomes. ***Objectives*:** To evaluate the indications, outcomes, efficacy, and complications of percutaneous sclerotherapy in the management of cystic lesions. ***Methodology*:** The study was a prospective cross-sectional study involving patients with cystic lesions referred for percutaneous sclerotherapy. Data was collected, analyzed, and presented in percentages, graphs, tables. Technical and clinical success rates were calculated. Efficacy was analyzed using chi-square test. ***Results*:** 27 patients with cystic lesions were treated. Most were females (77.8%), and males (22.2%), with a male-to-female ratio of 1:3.5. The commonest indication was pain (26.1%), followed by pressure symptoms (22.7%) and abnormal swelling (20.5%). Most lesions were located in the liver (25.9%), followed by the kidney (18.5%). Majority had significant improvement in clinical symptoms and size reduction with p-values < 0.05. The technical success rate was 100% and the clinical success rate was 96.3%. Minor complications were encountered including mild pain (7.4%), catheter blockage, cyst abscess formation, catheter insertion site infection, and inflammatory cyst septations (each 3.7%). ***Conclusion*:** Percutaneous sclerotherapy is a safe, efficacious treatment of cystic lesions with a high technical and clinical success rate. It should be considered as a first line of treatment for cystic lesions.

Keywords: Cystic lesions, Percutaneous sclerotherapy.

INTRODUCTION

Cystic lesions can develop in various organs and tissues, and are fluid-filled sacs that may arise from a variety of etiologies, including congenital malformations, infections, and neoplastic processes. Traditionally, the management of cystic lesions has involved surgical excision, particularly for symptomatic or growing cysts that pose a risk of complications(Ghanem *et al.*, 2017). However, surgical interventions often carry significant risks, including infection, scarring, and prolonged recovery times, which can be especially concerning in cases involving vital structures or in patients with comorbidities(Esson & Holme, 2016; Gong *et al.*, 2017.). These limitations have driven the search for less invasive alternatives, leading to the exploration of percutaneous approaches (Kole *et al.*, 2016).

Percutaneous sclerotherapy has emerged as a minimally invasive technique that involves the injection of a sclerosing agent into the cystic cavity, causing endothelial damage, inflammation, and subsequent fibrosis, which ultimately leads to the resolution of the lesion(Chowdhury *et al.*, 2024; Deventer *et al.*, 2021). It has been increasingly adopted across various medical fields due to its efficacy in treating a wide range of cystic lesions, including lymphatic malformations, thyroid nodules, hepatic cysts(Cronan *et al.*, 2020; Hanif *et al.*, 2018; Zhao & Yang, 2022). The procedure's minimally invasive nature, combined with its ability to be performed in outpatient settings, offers significant advantages over traditional surgical methods, including reduced recovery times, lower complication rates, and decreased healthcare costs(Gong *et al.*, 2017; Mavilia *et al.*, 2018; Vardakostas *et al.*, 2018).

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The aim of this study was to provide valuable insight regarding the common indications for percutaneous sclerotherapy in patients with cystic lesions, its short-term outcomes, the efficacy of the intervention, and its associated complications.

MATERIALS AND METHODS

The study was a prospective cross-sectional study, conducted at a level 6 national referral hospital, interventional radiology unit. Patients with cystic lesions referred for percutaneous drainage and sclerotherapy were treated.

Data including the indications of intra-lesional sclerotherapy, short-term outcomes, complications were collected, analyzed, and presented in percentages, graphs, pie charts, tables. Technical and clinical success rates were calculated. The efficacy of intralesional sclerotherapy was analyzed using chi-square test.

Patients eligible for the study were included as per the inclusion and exclusion criteria. The inclusion criteria were patients with cystic lesions referred for percutaneous sclerotherapy and the exclusion criteria were patients who had undergone surgical or other interventions for the cystic lesions and those allergic to the sclerosant medications.

Percutaneous Intralesional Sclerotherapy Procedure

The patient was received, consented and intravenous line placed. Vital signs were taken, and relevant pre-medications administered including pain medications, intravenous fluids.

The patient was then positioned, cleaned and draped. Sterile set with syringes, needles, and appropriate required supplies set. Lignocaine 2% was withdrawn and the required volume prepared using an appropriate dilution factor with normal saline/sterile water for injection (5- 10mls of 2% lignocaine diluted with an equal amount of 5-10mls of normal saline/sterile water for injection). The dose was maintained between 1-2mg/kg and care taken not to exceed the maximum lignocaine dose of 5mg/kg.

The sclerosant agent was also prepared using already calculated volume depending on the lesion size/volume, with note taken not to exceed the maximum recommended dose of the sclerosant agent. The sclerosants utilized were Bleomycin (0.5-1IU/kg), 99.9% absolute alcohol (Half of the initial cyst volume was used as the sclerosant volume and not exceeding 100mls or 1ml/kg maximum dose). Lesion volume was calculated using three dimensions with a multiplication factor of 0.52 to give the volume.

Lignocaine was injected on the skin and advanced upto the level of the lesion, under real-time ultrasound guidance. Once the cystic lesion was accessed, contrast test injection was administered under fluoroscopy to confirm the intralesional location of the needles or pigtail catheters and appropriate sclerosant volume was injected under fluoroscopic guidance. Images of the intralesional injection were then recorded. Ultrasound was also utilized to guide the sclerotherapy sclerosant injection process in real-time for lesions that were superficial and well visible by ultrasound. Additionally, Cystogram was done under fluoroscopy to confirm intra-cyst location and no extravasation before sclerosant injection was done. Dwell time within the cysts was 20 minutes then completely drained thereafter. Pigtail catheters were left within the large cysts to remain for a few days, and ensure adequate cyst drainage post-sclerotherapy, before they were removed. Smaller cysts were aspirated using gauge 17 coaxial needle and using the same needle, sclerosant injected and once the dwell time was achieved, all the sclerosant agent was aspirated fully and co-axial needle removed.

RESULTS

A total of 27 patients with cystic lesions were treated. 21 patients were females accounting for the majority (77.8%), and males were 6 comprising 22.2%, with a male-to-female ratio of 1:3.5. The commonest indication for treatment referral was pain (26.1%), followed by pressure symptoms (22.7%) and abnormal swelling (20.5%) (Figure 1).

Most simple cyst lesions we located in the liver comprising 25.9% followed by the kidney (18.5%). Other locations included the spleen, pancreas, thyroid, neck, mediastinum, hydatid cysts (splenic and liver), abdominal wall hematoma and abdominal wall tumor cysts, and breast seroma. Majority of the patients had significant improvement of clinical symptoms with a p-value <0.05. Similarly, there was a statistically significant reduction in the sizes of the lesions treated with a p-value of <0.05. The technical success rate was 100% and the overall clinical success rate was 96.3%. Mild pain (7.4%), catheter blockage, cyst abscess formation, catheter insertion site infection, and inflammatory cyst septations (each 3.7%), were the commonest minor complication encountered, with no major complications.

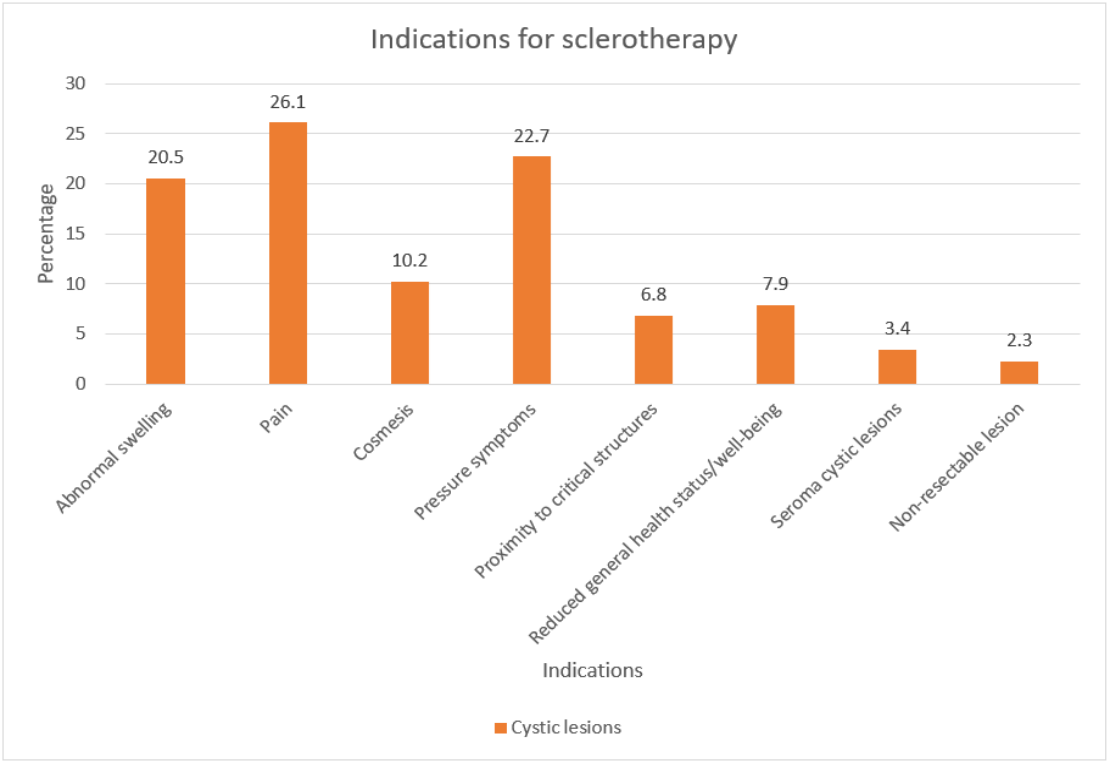

Figure 1: Indications for sclerotherapy

Clinical Outcome Response

Most patients demonstrated a significant improvement in the clinical symptoms post-sclerotherapy (Figure 2), with a reduction in pain and pressure symptoms, proximity to critical structures, and non-resectable lesions. Improvement was noted in cosmesis and general clinical health status/well-being. In all the patients treated, there was also a significant reduction in the sizes of the lesions. No change was noted in one patient accounting for 4.3%.

This clinical response to the percutaneous intralesional sclerotherapy treatment was statistically significant for both the clinical symptoms and size reduction with p-values <0.05 (Tables 1 & 2). The technical success rate was 100%, and the overall clinical success rate was 96.3% with good post-procedure patient recovery.

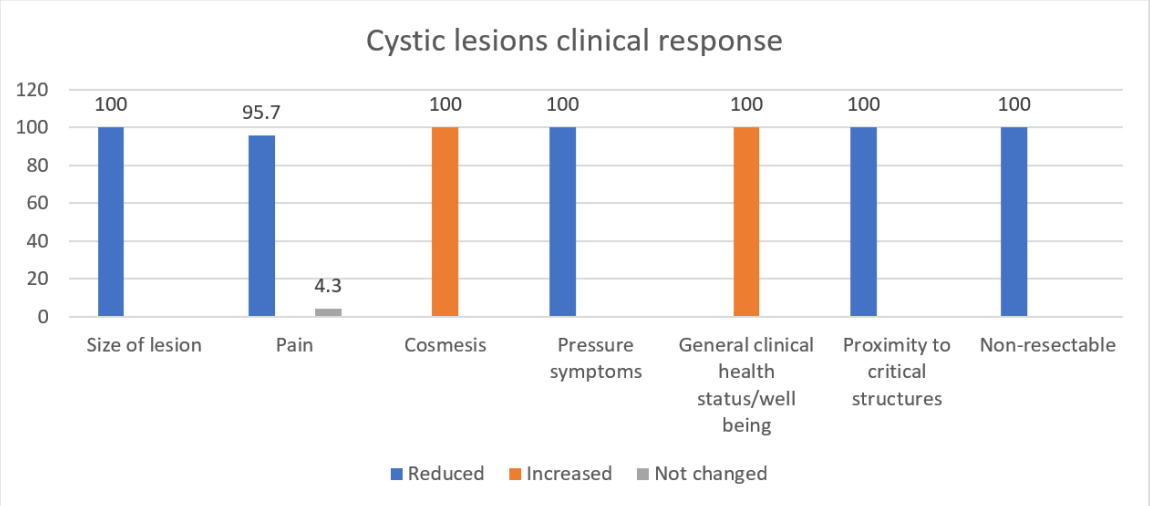

Figure 2: Bar chart showing cystic lesions treatment clinical outcomes symptom response

Efficacy of Percutaneous Sclerotherapy

Percutaneous sclerotherapy demonstrated high efficacy in cystic lesions treatment with a significant size reduction of the treated lesions as well as the patient symptom improvement with p-values < 0.05 (Tables 1 & 2). This significant treatment response indicates that percutaneous sclerotherapy procedure is therefore an efficacious treatment option for these cystic lesions

(Figures 3-5).

Similarly, no statistically significant association was found between the complications and the procedure, p-value > 0.05 demonstrating that percutaneous intralesional sclerotherapy for cystic lesions is a safe and efficacious procedure.

Table 1: Efficacy of clinical symptom response to percutaneous sclerotherapy treatment of the cystic lesions

	Cystic lesions clinical symptom response							
	Size of lesion	**Pain**	**Cosmesis**	**Pressure symptoms**	**General clinical health status/well-being**	**Proximity to critical structures**	**Non-resectable**	**P-value**
Reduced	27	22	0	20	0	27	27	0.0058491 *10-22
Increased	0	0	9	0	7	0	0	
Not changed	0	1	0	0	0	0	0	

The above shows that percutaneous intralesional sclerotherapy provided a statistically significant clinical improvement of symptoms after the intervention with a significant p-value of $0.0058491*10^{-22}$, thus demonstrating that percutaneous sclerotherapy is an effective and efficacious treatment method for cystic lesions.

Table 2: Efficacy of cystic lesions size reduction response

Clinical size reduction	Cystic lesions	P-value
>90% (Complete/near complete resolution)	18	0.00057
50-89% (Considerable/Significant reduction/marked response)	5	
21-49% (Moderate response/Partial reduction)	3	
<20% (mild response)	1	
No response/increased size	0	

The post-sclerotherapy size reduction response of the cystic lesions was statistically significant with a p-value of 0.00057, which indicated that the percutaneous intralesional sclerotherapy intervention produced a significant size reduction response in the cystic lesions treated and therefore proves an efficacious treatment option for these lesions.

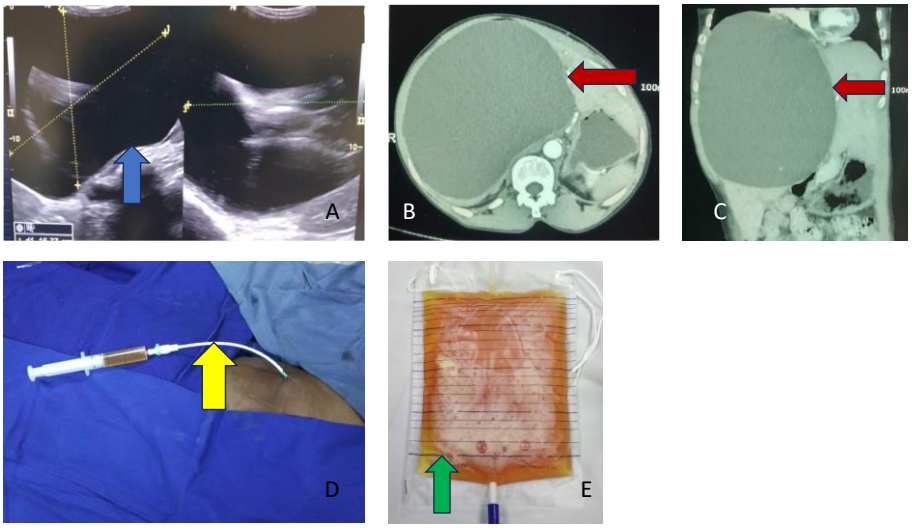

Figure 3: 56-year-old female patient with a large right lobe liver cyst.
A – Grayscale ultrasound image showing the large liver cyst (Blue arrow). Internal beam echo artefacts also noted due to the extremely large size of the liver cyst **B & C** – Axial (B) and Coronal (C) contrast-enhanced CT scans of the abdomen showing the large liver cyst (Dark Red arrows). **D** – Pigtail drainage catheter placed successfully and cyst fluid aspirated (Yellow arrow). **E** – Straw-coloured cyst fluid collected in the drainage urine bag (Green arrow). The patient had significant pressure symptoms with abdominal fullness, abnormal swelling and pain in RUQ, which were relieved after the drainage and percutaneous sclerotherapy

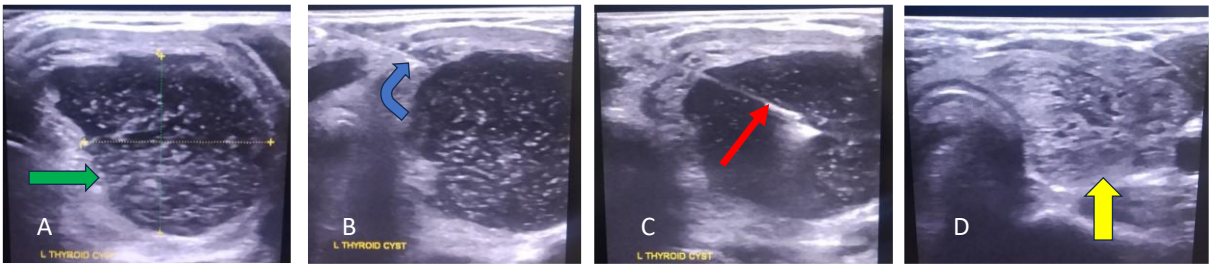

Figure 4: 40-year-old female with left lobe thyroid cyst.
A – Grayscale ultrasound showing the cyst containing echogenic debris within it (Green arrow).
B – Access needle at the outer margin of the cyst (Curved blue arrow). **C**– Access needle at the center of the cyst before the aspiration and subsequent sclerosant administration (Red arrow).
D – Cyst resolved post sclerotherapy (Yellow arrow). The patient's symptoms of swelling and pain also resolved post-sclerotherapy

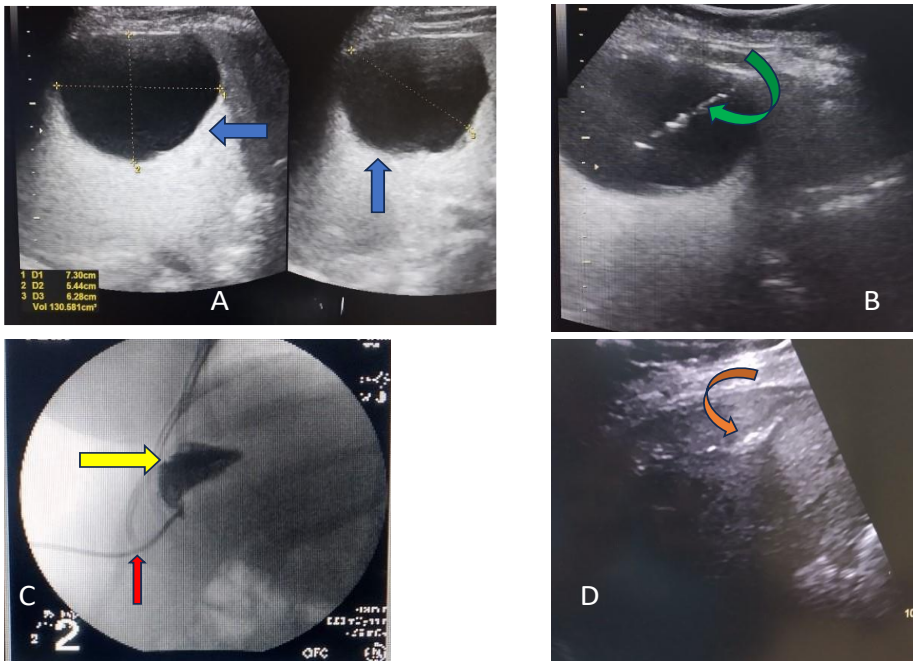

Figure 5: 41-year-old female with right lobe liver cyst and complaints of right upper quadrant pain and pressure symptoms.
A- Grayscale liver ultrasound image demonstrating large anechoic right lobe simple liver cyst (Blue arrows). **B** – Grayscale ultrasound image showing insertion of pigtail drainage catheter into the cyst with trochar still in situ before deployment of the pigtail catheter (Curved green arrow). **C –** Fluoroscopic cystogram image with pigtail catheter in situ (Red arrow) and cyst outlined with no contrast extravasation and sclerotherapy with absolute alcohol followed thereafter (Yellow arrow). **D** – Post sclerotherapy grayscale ultrasound image demonstrating complete resolution of the cyst with cavity showing focal gas and no residual fluid (Curved orange arrow).

Complications of Cystic Lesions Sclerotherapy

Mild pain (Likert pain scale of 3/10) was the commonest minor complication post sclerotherapy (7.4%). Others included catheter blockage, cyst abscess formation, catheter insertion site infection, and inflammatory septations cyst changes, each at 3.7% (Figure 6).

No major complication was encountered.

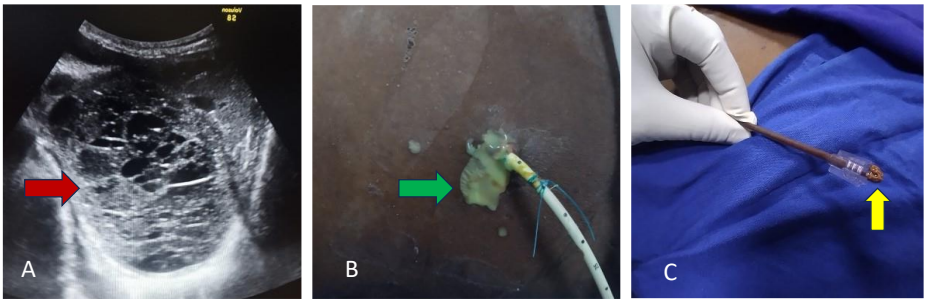

Figure 61: Complications encountered in the sclerotherapy procedures of cystic lesions
A –Internal cyst inflammatory septations which developed in a large right lobe liver cyst one week after sclerotherapy (Red arrow). **B** – Catheter site infection in a patient who had not undergone insertion site dressing change for more than a week and had site infection when she came back for review. It was just superficial on the skin and had not spread internally to the cyst. It was cleaned with iodine solution and antibiotics were given and resolved (Green arrow). **C** – Catheter blockage with debris and hematoma components, and, had also blocked the connecting tube, which was successfully unblocked and drainage restored (Yellow arrow).

DISCUSSION

Most of the patients were females (77.8%) compared to males (22.2%), with male to female ratio of 1:3.5. Most of the patients were in the category of 60-70yrs accounting for 29.6%. This was slightly different compared to Wijnads *et al.,* (2017) who found a higher female prevalence at 90%. This is likely due to regional differences and patient clinical presentation characteristics.

The commonest indication for percutaneous sclerotherapy was pain (26.1%). This was followed by pressure symptoms (22.7%) and abnormal swelling at 20.5%. This was similar to Shimizu *et al.,* (2022) who reported most liver cysts to cause abdominal discomfort, pain, distension and feeling of nausea, vomiting and fullness.

Patients who presented with an indication for cosmesis accounted for 10.2%, which is different compared to Hanif *et al.,* (2018) who analyzed sclerotherapy for orbital lymphatic malformations and found majority presented with vision changes and proptosis.

Majority of the cystic lesions were located in the liver at 25.9%, followed by renal cysts at 18.5%. This was different from Souftas *et al.,* (2015) who showed an increased predominance of liver cysts (73.7%) among symptomatic abdominal cysts. This was likely due to a wider range of cysts' locations that were studied in this study compared to Souftas *et al.,* (2015) who had a narrower range (only symptomatic abdominal cysts).

Neck cystic hygromas was 11.1%, pancreatic cysts 7.4%, and hydatid cysts 7.4%. Anoop *et al.,* (2022) found a higher incidence of posterior triangle neck cystic hygromas comprising 35%. They had higher incidence compared likely due to the selective nature of their sample population and slightly longer study duration. Abd El-Khalek *et al.,* (2018) demonstrated hydatid cysts at prevalence of 5.1% which was closely similar to this study's prevalence.

There was significant size reduction in 100% of cystic lesions, with pain reducing in 95.7%. Souftas *et al.,* (2015) similarly demonstrated 98.7% reduction in cyst size post sclerotherapy.

Cosmesis and general health status improved in all the patients at 100%. Pressure symptoms, proximity to critical structures and non-resectability reduced in all the lesions as well at 100%. Wijnads *et al.,* (2017) found symptom reduction in 72-100% and 56-100% complete symptom resolution. This was similar to this study findings and this demonstrates the high efficacy of the percutaneous sclerotherapy in cystic lesions management.

The overall volume reduction response for cystic lesions demonstrated >90% reduction in 66.7% of cases and 18.5% for between 50-89% (significant/marked response), 11.1% for moderate response (21-49%) and mild response 3.7% (<20%). This was similar to Wijnads *et al.,* (2017) who demonstrated size reduction of between 76-100% of aspiration and sclerotherapy of hepatic cysts. Above re-demonstrates the high efficacy of percutaneous sclerotherapy in the management of cystic lesions.

Majority of the cystic lesions were anechoic pre-sclerotherapy at 77.8% with a duction post sclerotherapy to 3.7%. This is in keeping with significant cystic lesions resolution. This was similar to Wijnads *et al.,* (2017) who noted patients with complete clinical response had significantly higher cyst reduction (Odds ratio of 1.02).

Percutaneous sclerotherapy of cystic lesions was found to be highly efficacious with statistically significant size reduction and symptom improvement

post-treatment with p-values < 0.05.

Radiological findings of the lesions also demonstrated significant radiological response post-sclerotherapy with p-value <0.05 and reinforced the efficacy of percutaneous sclerotherapy in the management of cystic lesions.

The pooled technical success rate was 100%, and the overall clinical success rate was 96.3% with good post-procedure patient recovery. This was similar to Kim *et al.,* (2022) who had a pooled technical success rate of 98.3%. Dalili *et al.,* (2021) had a technical success rate of 100%, with no significant associated complications.

There was no statistically significant association noted between complications and percutaneous sclerotherapy with a p-value of >0.05, indicating it is a safe treatment method for cystic lesions.

Mild pain was the commonest minor complication (7.4%). This was similar to Wijnads *et al*., (2017) who had pain at a rate of 5-90%, though they had a wider percentage incidence range of complications in their study. Catheter blockage, cyst abscess formation, catheter site infection, and inflammatory septations cyst changes were each 3.7%. Dalili *et al.,* (2021) similarly assessed the technical feasibility, clinical efficacy, and safety profile of percutaneous sclerotherapy using sodium tetradecyl sulfate in managing aneurysmal bone cysts associated with pain and neurological compromise and also found there were no significant associated complications. The above demonstrates that percutaneous sclerotherapy of cystic lesions is a safe and efficacious treatment option.

CONCLUSION

Percutaneous sclerotherapy is a safe and efficacious treatment of cystic lesions with a high technical and clinical success rate. It should be considered as a first line of treatment for cystic lesions.

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