



ORIGINAL RESEARCH PAPER

Radiodiagnosis

PERCUTANEOUS ETHANOL SCLEROTHERAPY IN CYSTIC NODULES OF THYROID UNDER USG GUIDANCE

KEY WORDS:

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ABSTRACT

To evaluate the efficacy, safety & associated complications of percutaneous ethanol injection (PEI) in the treatment of benign cystic thyroid nodules the study was carried out. The evaluation of the patients was done by USG using high frequency linear probe. The same probe was used to guide the needle. PEI was found to be a good treatment option with significant reduction in cyst volume. PEI is a cost effective, less time consuming, OPD procedure with no special instruments, machines required and with no special post procedural care needed. PEI is a very good treatment option for benign thyroid cystic nodules especially in Indian scenario where majority of the population is below poverty line and where there is overburden of patients.

INTRODUCTION

Thyroid disease can present as solitary or multiple nodules in symptomatic or asymptomatic patients. The contents of a thyroid nodule can be solid or cystic in various proportions. According to various studies, 15–30% of thyroid nodules are cystic or predominantly cystic^[1-5]. Most of the malignancies are seen in solid and hypoechoic nodules, but the presence of a cystic nodule does not rule out malignancy^[3,5]. Complex cysts account for 31% of thyroid nodules found on sonography, of which pure thyroid cysts comprise less than 1%^[6,7]. Fine-needle aspiration biopsy for thyroid nodules is being commonly used for diagnosis and treatment of thyroid cysts. However, aspiration by syringe is not appropriate for treatment because the recurrence rate after aspiration is as high as 58% depending on the size of cysts^[8,9].

Although surgical treatment is curative in large size nodule, it has disadvantages including general anaesthesia, post operative scar formation and iatrogenic hypothyroidism. According to the American Thyroid Association and the European Thyroid Association, a conservative (or nonsurgical) approach should be used for benign cystic thyroid nodules.

Sonographically guided percutaneous ethanol injection was first used for treatment of renal cysts and has been reportedly used for the treatment of autonomous thyroid adenoma with an efficacy rate of approximately 80%^[10-11]. Several researchers have reported the efficacy and safety of ethanol sclerotherapy for thyroid cystic nodules^[7,12-14]. Hence, we intended to determine the efficacy and safety of sonographically guided ethanol sclerotherapy (herein after referred to as "sclerotherapy") for benign thyroid cysts. A study to evaluate the role of percutaneous ethanol sclerotherapy in benign thyroid cystic nodules was done in 30 patients in leading teaching hospital, J.A. Hospital in Gwalior.

- This prospective study was conducted as collaboration between the department of Radiodiagnosis and department of Surgery. The study period was from July 2016 till September 2017. Consecutive patients who had presented to the Surgery department with complaints of goiter were considered.

INCLUSION CRITERIA-

1. Patients would be included of both sex & age groups between 15-65 years, with confirmed case of benign cystic nodules by FNAC.
2. Patient with normal thyroid profile (euthyroid).

EXCLUSION CRITERIA-

1. Malignant thyroid nodules.
2. Pregnant females.
3. Patients not giving consent for participation in the study.

Our study group consisted of total 30 patients out of which 22 women and 8 men (age range, 20–65 years; mean age, 42.46

years) with 20 complex cysts and 10 pure cysts. A thyroid cyst was defined as a nodule with a cystic component of more than 60%.

Most patients (n =26) were concerned about the cosmetic implication of the nodules, and a few patients complained of local discomfort (n = 3) and dysphagia (n = 1) and expressed fear about malignancy. Thyroid function was evaluated, and assessment of goiter for thyroid nodules was done using USG.

Nodules having two or more high risk features of malignancy on USG (irregular margins, hypoechoic nodules, nodules taller than broader, loss of peripheral halo, microcalcifications, increased central vascularity)^[10,31] underwent USG-guided fine needle aspiration (FNA) and cytology evaluation. Clinically and biochemically euthyroid patients who on clinical examination and neck USG had thyroid nodules, which were predominantly cystic (≥60% cystic) with at least 2 ml cystic component on USG were included in the study. Patients were excluded if they had 2 or more high risk feature of malignancy on thyroid USG^[10,3] or FNA suggestive of malignancy, suspicious, or indeterminate cytology. The study was approved by the institutional ethics committee. The study protocol was explained to all the patients and only those who gave informed written consent were included.

For sonography, SONOSCAPE MODEL A8 USG machine was used with a 5–11 MHz linear probe. The volume of a cyst, except a complex cyst, was determined using the following formula: length × width × height × / 6. For a complex cyst, volume was calculated as the volume of the cystic component other than solid areas.

Using sonographic guidance, we inserted a 20- to 22-gauge needle into the cystic nodule without placing the patient under local anesthesia. The cysts were aspirated under aseptic conditions using a 22 G (25 mm) needle with a 20 ml syringe in supine position with neck extended. Aspiration of maximal amount of fluid possible was attempted in each patient. In patients with thick fluid not draining with the 22 G needle, a second re-aspiration was attempted using a 20 G or 18 G needle. Sterile 100% ethanol specially manufactured & supplied by Changshu Hongsheng Fine Chemical Co. Ltd. of around 50-100% volume of fluid aspirated was injected into the cyst by changing the syringe with the needle in situ. The alcohol mixed colloid fluid was aspiration and fresh 100% ethanol was injected and left for 2-3 minutes and again re-aspirated as much as possible. The patients were reviewed clinically and ultrasonographically followed every month for consecutive 3 months and the side effects of ethanol sclerotherapy were evaluated by recording the symptoms of patients.

The effect of the therapy was presented as the volume reduction rate (volume reduction rate [%] = volume decrease [initial volume – final volume after treatment] / initial volume × 100%), and each case was classified into one of the following four groups: completely ablated cysts (complete responder), cysts with a

50–99% reduction in volume (responders), cysts with a 0–49% reduction in volume (non-responders)., and cysts with an increase in volume (non-responders).

Among non-responders at 1 month, those with <20% reduction in cyst volume underwent a second aspiration followed by ethanol injection using the same procedure as mentioned above. Seven patients underwent sclerotherapy twice and the remaining 23 patients underwent the procedure once.

RESULTS & OBSERVATIONS

**TABLE - 01
GENDER DISTRIBUTION OF PATIENTS**

S. NO .	GENDER	NUMBER(n=30)
1	Male	08
2	Female	22
TOTAL		30

- A total of 30 patients with thyroid swelling were included in the study.
- Out of these 30 patients 22 (73.3%) were female & 08 (26.6 %) were male.

AGE DISTRIBUTION OF PATIENTS

S NO	AGE GROUPS(IN YRS)	NO OF PATIENTS
1.	0-10	00
2.	11-20	01
3.	21-30	05
4.	31-40	09
5.	41-50	08
6.	51-60	05
7.	61-70	02
8.	71-80	00
9.	81-90	00
10.	91-100	00

- The youngest patient in the study was 20 year old and oldest was 65 year old.
- Maximum no. of patients were in the age group 31-40 years (30%).

The mean age of study group was 42.46 +/- 12 years .

**TABLE- 03
VOLUME OF CYST BEFORE THE PROCEDURE**

S NO .	VOLUME OF CYST (CC)	NO OF PATIENTS
1	0-10	26
2	11-20	2
3	21-30	1
4	31-40	0
5	41-50	0
6	51-60	0
7	61-70	1
8	71-80	0
9	81-90	0
10	91-100	0

In this study , most of the patients had volume of cyst before the procedure in the range of 0- 10 cc with one patient had volume in the range of 21-30 & 61-70cc.

**TABLE- 04
COMPARISON OF RESULT**

S NO	FINDING	RESULT
1.	Success Result	25/ 30 (83.3%)
2.	FAILURE	
	Failure (1-49% reduction)	4/30
	Failure (0% reduction)	1/ 30
	Total failure	5/30 (16.66%)
3.	Complete resolution	8/30 (26.6%)
4.	Repeat aspiration	7/30 (23.3%)

5.	Failure after repeat aspiration	3/30 (10%)
6.	Mean cyst volume	8.4 +/-11.8
7.	Complete reduction after 1 st follow up	3
8.	Complete reduction after 2 nd follow up	2
9.	Complete reduction after 3 rd follow up	3
10.	Complete reduction after all follow up	8

In our study, out of 30 patients:

- 25 (83.3%) patients showed more than 50% reduction in cyst volume (responder).
- 8 (26.6%) patients showed complete resolution of cyst (complete responder) .
- 17 (56.6%) patients showed 50-99% reduction in cyst volume(partial responder) .
- 5 (16.6%) patients showed less than 50 % reduction in cyst volume (non responders).
- 4 (13.3%) patients showed less 1- 49 % reduction in cyst volume.
- 1 (3.3%) showed 0 % reduction in cyst volume.
- Repeat aspiration done in 7(23.3%) patients who showed less than 20% reduction in cyst volume after 1st follow up .
- 3 (10%) patients showed failure after repeat ethanol injection

DISCUSSION

- Patients with benign cystic thyroid nodules usually seek treatment for cosmetic reasons or because of local compressive manifestations, such as dysphagia.^[80] In our study most of the patients were present with complaint of swelling with three patients present with complaint of local discomfort and one patient present with swelling and dysphagia.
- Most cystic lesions of the thyroid are considered to be caused by hemorrhage and subsequent degeneration of preexisting nodules^[14].
- Thyroid cysts rarely accompany malignant neoplasia. These cysts present as thyroid carcinoma in an average of 5% of patients, a lower probability than that of solid nodules^[12]. Pure cysts are associated with a lower probability of malignancy than mixed cysts^[7]. Malignant thyroid cysts confirmed by fine-needle aspiration biopsy usually require surgical treatment. However, for benign thyroid cysts, percutaneous tetracycline instillation, ethanol sclerotherapy, or thyroid hormone suppression therapy can be performed. Among these treatments, percutaneous aspiration has shown a high recurrence rate of up to 58% depending on the size of the cyst. Hence, for the treatment of recurrent cases, methods such as thyroid hormone suppression therapy and sclerosant instillation (sodium tetradecyl sulfate, hydroxy-polyethoxy-dodecan, tetracycline, or ethanol) were performed^[104, 105]. Thyroid hormone suppression therapy was found to have no effect, whereas tetracycline instillation has been shown to be relatively effective. However, in a prospective study, researchers reported that tetracycline did not offer any advantage over isotonic saline in the treatment of thyroid cysts^[106].
- Treatment of thyroid cysts with PEI was first proposed in 1987 by Edmonds et al^[108] and later in 1989 by Rozman et al.^[109] . The proposed mechanism of action is as follows: after injection of ethanol into the nodule, which is distributed in tissue by a diffusion mechanism, induces cellular dehydration and protein denaturation, which is followed by coagulation necrosis and reactive fibrosis which result in the obliteration of the cyst^[107].
- USG-guided PEI was first proposed by Livraghi et al,^[107] in 1990 for autonomously functioning thyroid nodules, which were later extended to management of benign cystic thyroid nodules.
- Yasuda et al.1992^[14] reported that with ethanol sclerotherapy, the cystic volumes decreased by more than half in 72% of the patients treated for recurrent thyroid cyst after fine needle aspiration biopsy. Cho et al. 2000^[110] also reported that in 68% of their patients with cystic nodules, the volumes decreased by

50% or more. According to their experience and other published studies on ethanol sclerotherapy, success is defined as near-disappearance or marked size reduction (>50%) of cystic lesion. In our study, 25 out of 30 patients (83.3%) showed complete disappearance or >50% reduction in cyst volume at the end of 3 months follow-up. 8 out of 30(26.6%) patients showed complete resolution of cyst after 3 month of follow up which is comparable to 4 out of 15 patients (26.6 %) of study conducted by SR Jayesh et al 2009^[111].

cosmetic problems or anxiety in patients with no significant complications during the procedure and follow up .

- In our study 7 out of 30 patients (23.3%) showed < 20% reduction in cyst volume which underwent 2nd setting of cyst aspiration and ethanol injection and re-aspiration which is more as compared to 10 out of 62 patients (15.8%) in study done by Nupur Basu et al in 2014^[112].
- In addition, the amount of aspirated fluid has an effect on the degree of ethanol ablation, but that was not quantified in our study. For example, ethanol sclerotherapy is more effective in pure serous cystic fluid than in gelatinous thick fluid. Further study of this effect is suggested.
- Complications of ethanol sclerotherapy, such as local pain at the injection site, transient hyperthyroidism, transient hoarseness, hematoma, and dyspnea, have been reported by several investigators^[113-115]. Local pain at the injection site, the most common complication reported by all the investigators, occurs as a result of the leakage of ethanol into the subcutaneous tissue. Transitory hyperthyroidism has been reported by Antonelli et al.^[12] and Kobayashi et al.^[115]. In our study 5 patients (16.6%) experienced transient local pain due to the leakage of a small amount of alcohol followed by facial flushing ,drunken sensation and headache which was observed in one patient. Major complications like intra-cyst hemorrhage and peri-thyroidal ethanol leakage was not observed. However, because a thyroid function test was performed before the sclerotherapy but not after the sclerotherapy, thyroid function could not be evaluated.
- In our series, several points can be mentioned as limitations. First, sample size was small and short duration of follow-up .
- Second, although the volume reduction rate was found to increase with an increasing amount of ethanol, we could not determine the effective amount of ethanol relative to the volume of a cyst or the amount of aspirated fluid.

Conclusion & SUMMARY

In our study 30 patients of benign thyroid cystic nodules were taken with 20 complex cysts and 10 pure cysts. Out of 30 patients 25 patients showed significant (>50 %) reduction in cyst volume as compared to previous volume. 8 (26.6%) patients showed complete resolution of cyst volume (complete responder) . Repeat aspiration done in 7(23.3%) patients who showed less than 20% reduction in cyst volume after 1st follow up. 3 (10%) patients showed failure after repeat ethanol injection. 5 (16.6%) patients showed failure with less than 50 % reduction in cyst volume. No significant adverse effect was noted during the procedure and follow up except for the local pain at the injection site .

In our study, PEI was not found to be good treatment option in term of complete disappearance of benign cystic thyroid nodules. But for cosmetic purpose, PEI was found to be a good treatment option with significant reduction in cyst volume. PEI is a cost effective, less time consuming, OPD procedure with no special instruments, machines required and with no special post procedural care needed. PEI is a very good treatment option for benign thyroid cystic nodules especially in Indian scenario where majority of the population is below poverty line and where there is overburden of patients .

In conclusion, percutaneous ethanol injection is an effective non surgical treatment for cystic thyroid nodules rather than in solid nodules. It should be the treatment of choice for those benign cystic thyroid lesions large enough to cause local discomfort,