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# Sonography and magnetic resonance tomography in monitoring of recurrent cysts lesions of the neck

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**Abstract**

Cysts of the neck are congenital cystic lesions of the neck, often presenting in childhood. Complete surgical excision is the treatment of choice for these lesions. Recurrence of cystic lesions of the neck after incomplete excision is fraught with complications due to the need for a second surgery and complications of the recurrent cyst itself. We herein report the details of recurrent cysts of the neck presenting at 3, 6, 12 and 18 months postoperatively.

**Keywords:** Cysts of the neck, ultrasound, MRI, recurrence, complications

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## Introduction

Neck cystic masses are fairly frequent developmental defects, and surgery is the only method of treatment, with early intervention usually recommended to avoid complications[1)]. As a rule, in surgical practice, there are three surgical approaches to excising cysts: surgical excision of the thyroglossal duct, simple excision of the cyst alone, or excision in accordance with the Sistrunk procedure. The Sistrunk procedure was introduced by W. E. Sistrunk in 1920 and involves resection of the cyst, tract, median part of the hyoid bone, and cuff surrounding the base of the tongue musculature.

Magnetic resonance imaging (MRI) is an established method of monitoring and evaluating the treatment of cystic neck formations in everyday practice. Postoperative scars can also become inflamed, representing one cause of recurrent neck cysts[2-5)]. The most frequent complication of such cysts is an infection, which in most cases leads to complete and incomplete fistulas, abscesses neck, abscesses, and low-current pyoinflammatory processes, such as local infiltration and lymphadenitis[3)]. There are typically anatomical variants of thyroglossal cysts (TGCs), which necessarily have their own internal fistula, and are the main cause of recurrence of TGCs of the neck. However, while such a definition is easy for operating surgeons to comprehend, it is not quite accurate with regard to the topographic anatomy[2)].

Monitoring neck cysts is important for predicting the appropriateness of a given treatment and determining the likelihood of recurrence. Ultrasound provides a simple and cost-effective solution to this problem, but it is important to take into account the presence of the distal parts of the internal ducts of the neck cyst. As ultrasound lacks the ability to obtain a three-dimensional image, it is in many ways inferior to MRI.

In this study, the utility of sonography and MRI for monitoring recurrence of cystic formations of the neck was evaluated.

## Material and methods

Ultrasound and MRI were used to monitor for recurrence of cystic formations of the neck in 19 patients at 3, 6, 12 and 18 months after an operation. TGCs were verified in 15 (78.9%) patients, and branchiolic cysts of the neck were noted in 4 patients (21.1%).

Relapse in 7 (36.8%) patients occurred after non-radical surgery in the volume of only the removal of the cystic cavity itself, without resection of the hyoid bone body, confirmed earlier by morphological examination-TGCs.

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Table 1 Background of 19 patients

| Patient Number | Age | Sizes | Contours | Shape | Cyst walls | Internal structure | Regional LAP | Type of resection |
|---|---|---|---|---|---|---|---|---|
| 1 | 12 y/o | 1.5×1.2×1.8 | Rough, fuzzy | Rounded | Thickened | heterogeneous | /+ | Resection by Sistrunk |
| 2 | 36 y/o | 2.3×1.5×1.2 | Smooth, clear | Awry | Thickened | Homogeneous | /– | Conventional cystic cavity resection |
| 3 | 52 y/o | 2.1×0.8×1.5 | Smooth, clear | Awry | Thickened | Homogeneous | /– | Conventional cystic cavity resection |
| 4 | 12 y/o | 0.8×0.5×1.0 | Rough, fuzzy | Rounded | Thickened | heterogeneous | /+ | Resection by Sistrunk |
| 5 | 10 y/o | 0.5×0.7×0.9 | Rough, fuzzy | Rounded | Thickened | heterogeneous | /+ | Resection by Sistrunk |
| 6 | 12 y/o | 1.2×1.5×0.8 | Smooth, clear | Awry | Thickened | Homogeneous | /– | Conventional cystic cavity resection |
| 7 | 26 y/o | 0.5×0.6×1.2 | Rough, fuzzy | Rounded | Thickened | heterogeneous | /+ | Resection by Sistrunk |
| 8 | 10 y/o | 0.3×1.2×0.8 | Rough, fuzzy | Rounded | Thickened | heterogeneous | /+ | Resection by Sistrunk |
| 9 | 18 y/o | 2.8×1.4×1.5 | Rough, fuzzy | Rounded | Thickened | heterogeneous | /+ | Resection by Sistrunk |
| 10 | 25 y/o | 2.0×1.8×1.3 | Smooth, clear | Awry | Thickened | Homogeneous | /– | Conventional cystic cavity resection |
| 11 | 20 y/o | 1.3×0.8×1.6 | Smooth, clear | Awry | Thickened | Homogeneous | /– | Conventional cystic cavity resection |
| 12 | 29 y/o | 0.8×1.4×1.2 | Rough, fuzzy | Rounded | Thickened | heterogeneous | /+ | Resection by Sistrunk |
| 13 | 13 y/o | 0.6×0.9×1.1 | Rough, fuzzy | Rounded | Thickened | heterogeneous | /+ | Resection by Sistrunk |
| 14 | 14 y/o | 0.5×.08×.1.0 | Rough, fuzzy | Rounded | Thickened | heterogeneous | /+ | Resection by Sistrunk |
| 15 | 12 y/o | 1.8×1.6×0.9 | Rough, fuzzy | Rounded | Thickened | heterogeneous | /+ | Resection by Sistrunk |
| 16 | 12 y/o | 1.4×1.3×1.1 | Rough, fuzzy | Rounded | Thickened | heterogeneous | /+ | Resection by Sistrunk |
| 17 | 11 y/o | 1.0×1.1×1.0 | Smooth, clear | Awry | Thickened | Homogeneous | /– | Conventional cystic cavity resection |
| 18 | 14 y/o | 1.8×1.5×1.1 | Smooth, clear | Awry | Thickened | Homogeneous | /– | Conventional cystic cavity resection |
| 19 | 12 y/o | 0.6×.0.9×1.1 | Rough, fuzzy | Rounded | Thickened | heterogeneous | /+ | Resection by Sistrunk |

The period until recurrence ranged from several months to 18 months, and in 3 (15.7%) patients, the process could be regarded as after an operation of inadequate volume, since the infiltrate under the scar was determined already in the postoperative period. Two (10.5%) patients were admitted to the clinic after a second recurrence of a TGC of the neck.

Sonography was used to diagnose cystic neoplasms in the pre-operative period (56 patients) and to monitor for recurrent cystic neoplasms (6 patients). The studies were carried out using SLE-501 and Affiniti-70 (Philips, Amsterdam, Holland) devices with linear sensors of 7.5 and 12 MHz, respectively. MRI was performed at 0.2 Tesla (Magnetom OPEN VIVA; Siemens Healthineers, Erlangen, Germany) using a parallel imaging technique at a 4-mm slice thickness with a 1-mm gap and an axial field of view (FOV) of 20 cm and a coronal field of view of 26 cm. Axial with fat suppression T2-weighted fast spin echoes (TR/TE, 4102-4269/90; 7150/134), axial with fat suppression T1-weighted spin echoes (TR/TE, 679-827/9-15), T2-weighted coronal with fat suppression spin echo (TR/TE, 3983-5283/80-90), and coronal uncompressed T1-weighted spin echo (TR/TE, 400-713/10-14; 432/27) images were obtained in all patients.

## Results

Table 1 showed the background of 19 patients. Ultrasound in 7 patients revealed cavity formation above the area of the postoperative scar, with clear, uneven contours; dimensions of 1.5±07 cm and homogeneous anechoic content. We observed 13 incomplete median fistulas; 1 was iatrogenic in origin, and 7 after non-radical removal of the median cyst of the neck-operations were performed without resection of the hyoid bone body (Table 2). The frequency of relapse of cystic neck formations within six months after surgery is shown in the Table. In two patients, recurrence of cystic formation was observed twice. Six patients had a complete external fistula of cystic formation, and in 13 patients, there was an internal duct of cystic formation of the neck.

TGCs are often prone to relapse, and such relapse was noted in 15 of our 19 patients. In four cases, relapse occurred in patients with Type II branchial cysts. The localization of TGC relapse differed, but for branchial cysts, the relapse localization was similar. In 8 of the 19 patients, drainage of the cystic cavity was observed in the anamnesis due to infection of the postoperative scar (Table 3). In 7 of the 19 patients with recurrent neck cysts, sonography showed unsatisfactory postoperative removal of cysts, i.e. the formation of a recurrent cyst. In other cases, results that were suggestive of infiltration of the postoperative scar were seen.

On ultrasound, the presence of a small subcutaneous emphysema, soft tissue edema made it difficult to fully visualize the postoperative period of the wound, and this cause of the fracture area during ultrasound examination. This prevented control from being achieved in 3 (15.7%) patients, the process could be regarded as after an operation of inadequate volume, since the infiltrate under the scar was determined already in the postoperative period.

The vast majority of cases of recurrent neck cysts in our study were TGCs, which show hypointensive signaling on T1-weighted imaging (T1WI) and hyperintensive signaling on T2WI. In the 12 (63.2%) patients with slight infiltration and heterogeneity of the cyst, the intensity of T1 and T2 signals was determined. Using MRI, recurrent cystic formation of the neck was determined to be due

Table 2 Demographic and clinical factors preceding the recurrence of cystic neck lesions

| | Relapse | | | |
|---|---|---|---|---|
| | **3 month** | **6 month** | **12 month** | **18 month** |
| Age (average value) | 6 ± 0.2 | 12 ± 0.5 | 16 ± 0.6 | 21 ± 1.2 |
| Sex: | | | | |
| • F | 3 | 6 | 2 | 2 |
| • M | 1 | 3 | 1 | 1 |
| Preoperative diagnosis: | | | | |
| • Median cysts | 3 (15.7%) | 2 (10.5%) | 5 (26.3%) | 5 (26.3%) |
| • Lateral cysts | 1 (5.2%) | 1 (5.2%) | 1 (5.2%) | 1 (5.2%) |
| Localization: | | | | |
| • Intralingual | 1 (5.2%) | | 2 (10.5%) | 1 (5.2%) |
| • Supra-lingual | 2 (10.5%) | 2 (10.5%) | - | 1 (5.2%) |
| • Sublingual | 1 (5.2%) | 2 (10.5%) | 1 (5.2%) | 2 (10.5%) |
| • On the side of the neck | 2 (10.5%) | | | 2 (10.5%) |
| Drainage of the cystic cavity: | | | | |
| • Yes | 2 (10.5%) | - | 2 (10.5%) | 2 (10.5%) |
| • No | - | - | 1 (5.2%) | 1 (5.2%) |
| Type of resection: | | | | |
| • Conventional cystic cavity resection | 7 (36.8%) | | | |
| • Resection by Sistrunk | 12 (63.2%) | | | |
| Postoperative infection | 7 (36.8%) | | | |

Table 3 Ultrasound and MRI are signs of recurrent cystic formations of the neck

| **Features** | **US** | **MRI** |
|---|---|---|
| Localization | Median cysts 5 (26.3%)<br>Lateral cysts 2 (10.5%) | Median cysts 15 (78.9%)<br>Lateral cysts 4 (21.1%) |
| Sizes (max. diameter) | 1.5 ± 0.7 cm | 3.8 ± 2.0 |
| Contours: | | |
| • Smooth, clear | 2 (10.5%) | 7 (36.8%) |
| • Rough, fuzzy | 5 (26.3%) | 12 (63.2%) |
| Shape: | | |
| • Awry | | 7 (36.8%) |
| • Rounded | 7 (36.8%) | 12 (63.2%) |
| Cyst walls | | |
| • Normal (1–2mm) | 5 (71.5%) | |
| • Thickened | 2 (28.5%) | 100% |
| Internal structure: | | |
| • Homogeneous | 5 (26.3%) | 7 (36.8%) |
| • heterogeneous | 2 (10.5%) | 12 (63.2%) |
| The presence of internal septae | - | - |
| Invasion of surrounding structures | - | - |
| Cause of relapse | not detected | detected in 100% |
| Regional LAP | 3 (15.7%) | 12 (63.2%) |
| Type of resection: | | |
| • Conventional cystic cavity resection | 5 (26.3%) | 7 (36.8%) |
| • Resection by Sistrunk | 2 (10.5%) | 12 (63.2%) |

Table 4 Background of 8 patients

| | **Age** | **Sizes** | **Contours** | **Shape** | **Cyst walls** | **Internal structure** | **Regional LAP** | **Type of resection** |
|---|---|---|---|---|---|---|---|---|
| 1 | 36 y/o | 0.7×1.2 | Rough, fuzzy | Rounded | 2 mm | Homogeneous | /– | Conventional cystic cavity resection |
| 2 | 52 y/o | 0.8×1.5 | Rough, fuzzy | Rounded | 2 mm | Homogeneous | /– | Conventional cystic cavity resection |
| 3 | 18 y/o | 1.4×1.5 | Rough, fuzzy | Rounded | Thickened | heterogeneous | /+ | Resection by Sistrunk |
| 4 | 25 y/o | 2.0×1.8 | Smooth, clear | Rounded | 2 mm | Homogeneous | /– | Conventional cystic cavity resection |
| 5 | 12 y/o | 1.2×1.8 | Rough, fuzzy | Rounded | Thickened | heterogeneous | /+ | Resection by Sistrunk |
| 6 | 12 y/o | 1.3×1.1 | Rough, fuzzy | Rounded | 2 mm | Homogeneous | /+ | Conventional cystic cavity resection |
| 7 | 14 y/o | 1.8×1.5 | Smooth, clear | Rounded | 2 mm | Homogeneous | /– | Conventional cystic cavity resection |

to incomplete radical removal of the cystic cavity in preceding lateral cysts of the neck in 4 (21%) cases, simple resection of the cystic cavity itself in 7 (36.8%) cases and incomplete identification and elimination of the internal ducts of the neck cysts with Sistrunk surgery in 8 (42.1%) cases (Table 4).

## Discussion

The recurrence rate of TGCs after complete excision using the Sistrunk procedure is reported to be 2.6%–5%, whereas simple excision of the cyst can result in recurrence rates as high as 38%–70%. Previous authors[6-11] have reported just 2 cases of recurrence in a series of 62 patients. Swaid et al.[11] reported a recurrence rate of 10% in a series of 270 patients, with most recurrences occurring when the middle third of the hyoid was left intact. A recurrence rate of 3.4% was reported in a series of 29 patients who underwent the Sistrunk procedure[12, 13], while recurrence rates ranging from 1% to 30% have been reported in a few other series[1, 2].

The most common cause of recurrence is rupture of the cyst intraoperatively or leaving a part of the wall behind. Various methods have been used to treat branchial cleft cysts. Complete surgical excision of the cyst is the treatment of choice for these cysts. Incision and drainage are most commonly used to treat infected branchial cleft cysts, but the associated recurrence rate is high[6]. Open complete surgical removal of fistulous tract in case of branchial fistula is therefore preferred due to the low associated recurrence rate (5% at 2 years' follow-up)[2].

In the series conducted by Hazenberg et al., the postoperative recurrence rate was 3%[4]. In another retrospective series by Prasad et al., among 34 cases, the incidence of branchial fistula was 20 (58.82%), while branchial cyst was found in 14 (41.17%) cases[7, 8]. The low recurrence rate of 1.2% was believed to be due to the good identification of the fistulous tract with the aid of methylene blue dye, good magnification with magnification loops and a microscope and wide excision of the tract along with the surrounding tissue.

Generally, the etiology for the increased recurrence might be postulated to be an extension of the cyst through the carotid bifurcation, as might be expected due to suggested origin from second branchial arch remnants[1, 2].

## Conclusion

As our studies have shown, on sonograms, cystic formation manifests in the form of an anechoic, weakly hypoechoic structure formed in the scar area, leaving the cause somewhat unclear. MRI allows for the identification of even the smallest cystic areas, which contributes to its utility in monitoring for the recurrence of neck cysts.

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