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TREATMENT OF CYSTIC THYROID NODES THROUGH A COMBINATION OF SCLEROTHERAPY AND LASER INTERSTITIAL THERMOTHERAPY

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Abstract

The technology of cystic nodular goiter treating with the volume of liquid component from 20 to 80 % using a combination of sclerotherapy by ethanol (SE) and laser interstitial thermotherapy (LITT). At the beginning, we performed the complete obliteration of the cyst cavity connective tissue by the SE, and LITT for effecting on tissue component node. We used 70 % ethanol solution and diode laser with a wavelength of 1060 nm, power 2,8-3,2 watts. The dynamics of follow - SE cysts cavity, and after LITT - the tissue component node gradually, respectively, 6 and 9 months transformed into connective tissue. The slowdown in the process of reduction of cysts or tissue site during these periods and of nodular parenchyma cells considered indications for redo SE or LITT. In all 109 patients the treatment proved to be effective - cystic node transformed to connective tissue. Contraindications to the use of a combination CE and LITT had hypothyroidism, autoimmune thyroiditis, multinodular goiter volume of tissue component unit more than 60 % by volume of particles gland or multycyst transformation of nodules. Pathological influence of SE or LITT for the structure of paranodular parenchyma and parenchyma of the gland and its function is not found. After 3 years after treatment in 87 patients studied changes in the structure, function and thyroid volume and hem in place node were observed.

Key words: cystic nodular goiter, treatment, sclerotherapy with ethanol, laser thermotherapy.

Foreword. Minimally invasive technologies such as laser interstitial thermotherapy (LITT) and ethanol sclerotherapy (SE) are widely and effectively used to treat benign lesions in the thyroid gland [1-4]. There are reports of their combined use for the treatment of cystic nodes. According to this technology, initially made the sclerosis of liquid formation, and the second - hold LITT node parenchyma [5, 6].

However, the widespread use of combination of SE and LITT for the treatment of nodular cystic goiter has not received as not clear questions about indications and contraindications, technologies and modes of implementation, assessment of direct and long-term results. Analysis of the literature shows that these issues require extensive discussion and are far from solved.

Purpose: develop and indications for use of the technology for the treatment of cystic nodular goiter using a combination of ethanol sclerotherapy and laser interstitial thermotherapy, evaluate prognostic factors of efficiency, long-term results and side effects of treatment.

Materials and methods. Treated 109 patients aged 28 to 62 years, including 102 women and 7 men. Duration of disease goiter ranged from 7 to 23 years. Individual volume units ranged from 1,3 to 10,2 cm^3 ($M \pm m = 4,31 \pm 0,24$ cm^3); confidence interval (CI) - 3,84-4,77 cm^3). As a result of hormonal studies all patients were euthyroid state. In the first phase of treatment we performed SE, the second - LITT. Before treatment was performed cytological verification. The study included patients with only a benign process.

Indication for combined treatment of cystic nodes using SE and LITT consider benign nodes with a volume of liquid component in the range of 20 to 80 % of the total site, which during the year increased by 15-20 %. The motivation of this evidence is that the LITT is effective in the treatment of various solid nodes echostructure and solid-cystic nodes with cystic component volume less than 20%. Efficiency of LITT decreases with increasing volume of liquid component of more than 20 %, because the presence and quantity hinder the maintenance of temperature on the therapeutic level. It is with the volume of liquid component to 20 % of such probability is low. However, in cases where the volume of liquid component close to 80 % or more for treatment are sufficient SE, and the need to apply LITT there.

Contraindications to the combined use of SE and LITT share in non-specific and general. Specific - belong polycystic site. In this case, not only combined, but a separate application for SE and LITT will be ineffective. Such patients treated with appropriate surgical indications. General contraindications to combined use of SE and LITT feel the presence of hypothyroidism, autoimmune thyroiditis, multinodular goiter, pathological changes in the tissue of cancer at a stage of subcompensation integral factor of more than two and when the volume of tissue component unit is more than 60 % by volume of particles gland, which is located node. Note that strict adherence testimony is the key to successful treatment in each case.

Treatment was performed as outpatients. Is need for special preparations for the treatment. Anesthesia is not used. After completing the SE and LITT the patient was under an hour nursing supervision. On the day of treatment recommended limiting physical activity to avoid overheating and overcooling of the body. When the pain in the front of the neck advised to take the pain medications, including analginum.

As sclerosant, used 70 % ethanol solution. The effectiveness of treatment was assessed by ultrasonography results, which were carried out on 1st day after SE and 2 weeks, 1, 3, 6, 9, 12 months. We studied the changes in volume units, echogenic characteristics cystic content node tissue, and its capsule paranodular tissue involution reasons for the delay unit and indications for re SE. After replacing the cyst cavity connective tissue for the treatment of tissue component unit used birthday.

During the LITT, using high-energy diode surgery laser «Lakhta-Milon» in a continuous mode radiation with a wavelength of 1060 nm. Power laser chosen depending on the echogenicity of nodes: at hypoechoic it was 2,8 watts izoechoic - from 2,8 to 3,0 watts. The energy delivered to the site using silica monofilament fiber-polymer shell with a diameter of 1 mm. Changes in the node structure and paranodular gland tissue after the LITT determined by the results of the ultrasound scan in a day, 2 weeks, 1, 3, 6, 9, 12 and 15 months after the manipulation. We investigated the amount of tissue at the site node, its structure, echogenicity, blood supply, the presence of inclusions. Gland function was studied indicators of thyroid-stimulating hormone, free thyroxine levels and the degree of influence SE and LITT on tissue parenchyma - the level of thyroid peroxidase antibodies before treatment and at 1 and 6 months after treatment. Before the treatment we determine the level of calcitonin to rule out the medullary cancer. The study was conducted on analyzer "Immulayt" firm DPC (USA).

The effectiveness of treatment was evaluated on the basis of - cured node is completely replaced by connective tissue and not threated when the remnants node by ultrasound or biopsy, thyroid parenchyma determined.

Results of the treatment parameters for repeated surveys over 3 years compared to afterwards, study in 87 patients. The subject of the evaluation function and dimensions were cancer, structural changes in the parenchyma and area of scar cured in place node.

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Statistical analysis of the results of the statistical system in the department of research SHEI "Ternopil State Medical University Ministry of Health of Ukraine" in the software package Statsoft STATISTICA. The correlation coefficient was calculated by the Spearman and changes of authenticity - on Wilcoxon.

The research outcomes and discussion.

On the 1st day SE in all patients was determined by liquid component volume which was close to the start of treatment. Cytological picture resembled the picture after treatment of thyroid cysts. In paranodular tissue of patients observed leukocyte infiltration of small and moderate edema.

2 weeks after the CE unit volume of liquid component decreased and ranged from 1,1 to 9,2 cm^3 (M ± m = 3,77 ± 0,21) cm^3; CI - 3,35-4,19 cm^3; p <0,05). The volume of individual units decreased from 0,3 to 0,9 cm^3.

A month after the SC volume of liquid component units continued to decrease. The volume of individual units ranged from 0,8 to 7,2 cm^3 ((M ± m = 2,92 ± 0,17) cm^3; CI - 2,59-3,25 cm^3; p <0,05).

3 months after SE of cystic node completely transformed connective tissue in 62 patients (56,9 %). In these patients to the treatment unit volume individually was in the range of 1,2 to 3,7 cm^3 ((M ± m = 2,38 ± 0,09) cm^3; CI - 2,20-2,56 cm^3) . After sclerotherapy it gradually decreases, and after 3 months of follow-cavity fluid component completely transformed connective tissue. Thus, during this period the survey in each case volume unit consisted of its volume and the volume of tissue component of the connective tissue, which transformed the liquid component, which ranged from 0,8 to 1,8 cm^3 ((M ± m = 1,18 ± 0,04) cm^3; CI - 1,45-1,71 cm^3), the reliability of changes compared to SE and according to the 2–nd week was p <0,000 (Figure 1) . These patients continued treatment units using LITT.

Fig. 1. Dynamics of nodes volume in patients with complete treatment liquid component at the 3rd month after SE. Note: here and in Figures 2 and 5 horizontal - periods of observation.

In general, all patients treated with SE 3-month observation volume units, compared to before treatment and at the 2nd week after the SE continued to decline. Individual volume units ranged from 0,8 to 6,1 cm^3 ((M ± m = 2,40 ± 0,15) cm^3; CI - 2,10-2,71 cm^3), the reliability of changes compared to According to the SE and the 2nd week was p <0,000.

After 6 months of treatment in 38 patients has been ascertained complete replacement units connective tissue. Before treatment, the amount of units in these patients ranged from 4,7 to 10,2 cm^3 ((M ± m = 6,52 ± 0,21) cm^3; confidence interval - 6,09-6,95 cm^3). At stages follow-SE units individually volume gradually decreases, and 6-month liquid component units fully obliterated. During this period, the survey volume units ranged from 1,6 to 3,9 cm^3 ((M ± m = 2,47 ± 0,07) cm^3, CI - 2,32-2,61 cm^3). The reliability indices changes, compared to the 1 st, 3 rd month was p <0,0000 (Fig. 2). These patients were held laser thermotherapy tissue component unit according to your specifications.

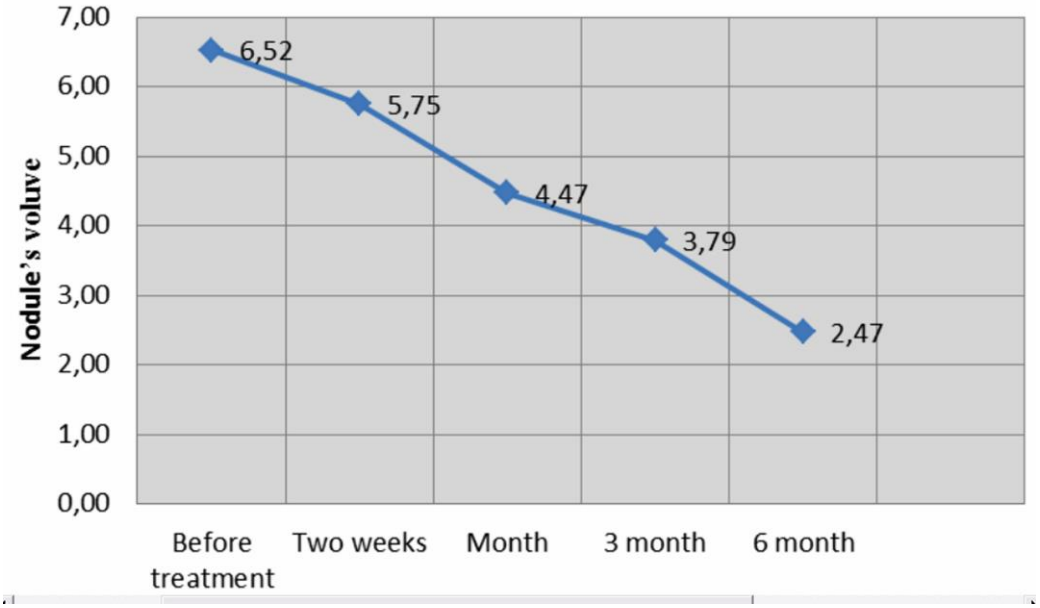

Fig. 2. Dynamics of nodes volume in patients with complete treatment liquid component at the 6th month after SE.

In 9 cases during this period the survey was available liquid component unit volume from 0,5 to 1,6 cm^3. A needle biopsy in the study revealed punctate characteristic elements and contents of the cyst high prismatic cells. These patients re-appointed SE using the same quantitative and qualitative characteristics of sclerosant and conditions of exposure.

Testing for 9 months and 3 and after re-CE showed that in all 9 cases liquid component node transformed connective tissue and obliterated. In these patients, the amount of units to treatment ranged from 7,2 to 9,5 cm^3 (($M \pm m = 8,20 \pm 0,26$ cm^3; CI - 7,59- 8,81 cm^3), and after observation - from 1,8 to 2,9 cm^3 (($M \pm m = 2,34 \pm 0,13$ cm^3; CI - 2,05-2,64 cm^3). The changes compared to figures for 1, 3, and 6 months, were reliable - $p < 0,0000$ (Fig. 3). In terms of volume of tissue component units treated using laser thermotherapy.

Fig. 3. Dynamics of volume units in patients completed treatment liquid component on the 9 th month of the SE.

All patients in the second stage held laser thermotherapy treatment. Characteristics of diode laser were as follows: power - 3,0-3,2 watts, continuous operation, the duration of the session - 10 to 15 minutes. For ultrasonic characteristics distinguish between hypo- and izoechoic units (Table 1).

Table 1. Echogenicity and units volume

Volume	Echogenicity		Total
	hypoechoic	izoechoic	
Till 2 cm^3	38	29	67
More than 2 cm^3	23	19	42
Total	61	48	109

Preliminary analysis showed that the reduction of the volume of units after the LITT was different and depended on the initial volume, that volume is noted for the thermotherapy, and echogenicity of nodes. Therefore, the results of follow changes of volume units after the LITT studied separately in two arbitrarily selected subgroups of patients, with an initial capacity of nodes to 2 cm^3 - the first subgroup and more than 2 cm^3 - the second subgroup.

On the 1st day after the LITT volume units increased, and this increase was an average of about 12 % compared with the original data ($M \pm m = 1,52 \pm 0,05$; CI - 1,43-1,61; $p < 0,05$). According to the US, interstitial edema of nodular tissue determined. Changes in the structure of connective tissue and swelling at the site of the liquid component and paranodular gland parenchyma were observed.

After 2 weeks after the LITT volume the units decreased to baseline values. Swelling node tissue decreased, partly noted, some fires, destructive changes in tissue site.

After 1 month of treatment reducing the amount of units in the first and second group was respectively 16,7 and 35,3 % ($M \pm m = 0,93 \pm 0,04$; CI - 0,85-1,01; $p < 0,05$, and $M \pm m = 1,63 \pm 0,07$; CI - 1,49-1,76; $p < 0,05$). Ultrasonic noted drain node tissue source of destruction and its replacement by connective tissue hyperechoic. Changes in the structure of paranodular tissue was observed.

After 3 months in 52 patients (47,7 %), including 40 in the first sub-12 in the second subgroup, by ultrasound, noted the complete replacement of host connective tissue. Of the 40 patients first subgroup hypoechoic nodes were found in 31 case izoechoic - 9. Initial volume in units was in the range of 0,8 to 1,3 cm^3 ($M \pm m = 0,98 \pm 0,03$), and at cure - from 0,3 to 0,5 cm^3 ($M \pm m = 0,4 \pm 0,01$ cm^3), significant changes - $p < 0,05$. Reducing the volume of units the average was about 59 %. In all patients the second subgroup nodes were hypoechoic. Initial their

volume ranged from 2,1 to 2,2 cm^3, and the amount of scar – 0,6-0,7 cm^3, respectively, M ± m = (2,01 ± 0,01) and (0,67 ± 0,01) cm^3 (p <0,05). Thus, the decrease was about 67 %. The rest of the patients in both subgroups decreased volume units: the first subgroup – 41 %, and the second – 54 % compared with the original data, changes in both subgroups significant (p <0,05). In all patients the functional activity of the gland changes were within euthyroidism and compared with the figures a month, unreliable (p> 0,05). The structural nodes defined in section hyperechoic node tissue and tissue destruction with signs.

At the 6-month observation is found in 39 patients' ultrasound signs of scar tissue replacement units. Patient's first subgroup was 20, all nodes izoechoic, and the second - 19. Among them, 11 revealed hypoechoic nodes, 8 - izoechoic. Patients first subgroup output volume units ranged from 1,3 to 1,8 cm^3 (M ± m = (1,52 ± 0,04 cm^3)), and the amount of scarring engagement-from 0,5 to 0,6 cm^3 (M ± m = (0,58 ± 0,01) cm^3); (P> 0,05). Thus, reducing the volume of the node relative volume scar was about 62 %. At second subgroup volume units to treatment ranged from 2,3 to 2,7 cm^3 (M ± m = (2,51 ± 0,03 cm^3)), and the volume of scars - from 0,5 to 0,7 cm^3 (M ± m = (0,65 ± 0,01 cm^3)). Reducing the volume of units was about 74 % (p <0,05). According to the US, structural changes in the connective tissue in place of liquid component and paranodular gland parenchyma compared with the results for the 3 months was observed.

After 9 months after the LITT of the amount of connective tissue in the area of cured 91 patients nodes unchanged. In 18 patients, 7 of them in the first subgroup and 11 second subgroup regression volume units, compared to the results for the 6 months does not exceed 12 %. Overall, compared with the original data, units in these patients decreased after the LITT within 52 % (first subgroup) and 41 % (second group). Prior to the LITT in 7 of these units had volume 1,8-1,9 cm^3 (all hypoechoic), 11 - from 2,7 to 3,1 cm^3 (all izoechoic). To establish the cause's slowdown reduction units had fine-needle aspiration biopsy tissue component units. Cytological study revealed connective tissue and thyroid epithelium. The presence of thyroid epithelium in such cases considered indications for repeat LITT. These patients underwent a second LITT with laser power of 3,2 watts. The duration of the laser propagation time determined clouds the whole amount of residual parenchyma site.

After 3 months after the second LITT of the connective tissue replacement unit noted in 11 patients, including 7 in the first subgroup (all hypoechoic) and in 4 - second (all izoechoic). The initial volume of tissue component node in the first subgroup of patients was in the range of 1,7 to 1,9 cm^3 (M ± m = (1,8 ± 0,03) cm^3), and the second subgroup - from 2,7 to 2,9 (M ± m = (2,83 ± 0,05) cm^3). Accordingly, the amount of scar tissue at the site node was 0,5 to 0,7 cm^3 (M ± m = (0,61 ± 0,03) cm^3) and from 0,6 to 0,8 cm^3 (M ± m = (0,70 ± 0,04) cm^3). Thus, the amount

of scar tissue relative to the source component unit volume in the first subgroup was 34 %, while the second – 25 % (p <0,05). The dynamics of changes in the volume of the treatment units, using LITT shown in figure 4.

Fig. 4. Dynamics of volume units after treatment with LITT in patients with node output volume till 2 cm^3.

In 7 patients the second sub-volume units decreased from 1,33 ± 0,05 to 1,14 ± 0,04. According to the US in these patients in the field units in place thyroid tissue noted structureless mass of isolated foci of increased density.

At 6-month follow-up after re LITT in 7 patients second subgroup noted the replacement node tissue connective tissue, and treatment was completed. The volume of scar tissue ranged from 0,6 to 0,8 cm^3 (M ± m = (0,69 ± 0,03) cm^3). Output volume units, for the LITT, these patients ranged from 2,9 to 3,9 cm^3 (M ± m = (3,13 ± 0,13) cm^3). Thus, reducing the volume of units as a result of thermotherapy was 77,9 % (p <0,05). Data on the size of nodes on stage after the LITT observation is shown in Figure 5.

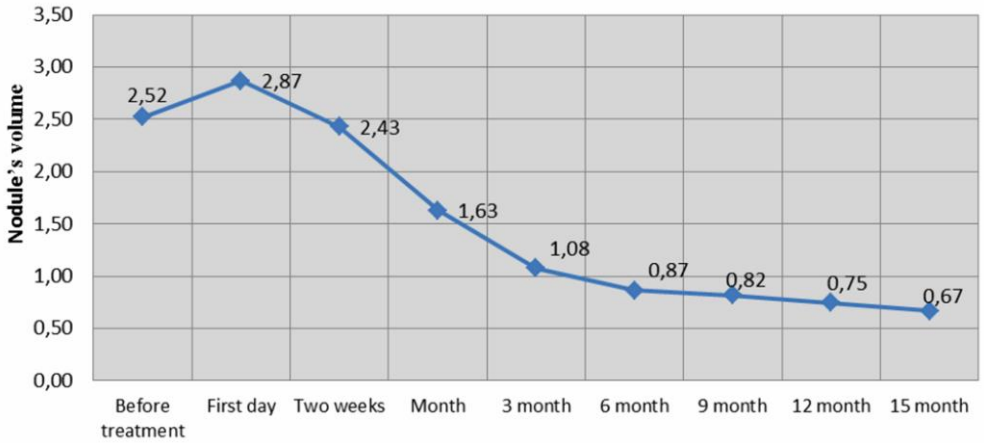

Fig. 5. Evolution of volume units after treatment using LITT in patients with node output volume of more than 2 cm^3.

So after the second LITT noted in all cases replacement node tissue connective tissue.

After 3 years after treatment 87 patients examined. As a result of ultrasonography studied structural changes in the gland and the area of the scar, their size, and according to hormonal studies - cancer function. Thyroid volume in the control survey, compared to the end of treatment was not significantly changed ($M \pm m = 18,7 \pm 0,2$ and $18,2 \pm 0,18$; $p > 0,05$). The same orientation changes characteristic of scar size ($M \pm m = 0,63 \pm 0,04$ and $0,61 \pm 0,04$; $p > 0,05$). Changes in the structure of paranodular gland parenchyma and all were found. In all surveyed gland function was within euthyroidism and its changes compared to the rates after treatment were within reference values. The same is largely true of antibodies to thyroid peroxidase index. So after 3 years after treatment of cystic nodes by combining CE and LITT changes in the size and structure of scar paranodular tissue, the entire gland parenchyma and its functions were found. This indicates that the treatment of nodular cystic goiter using a combination of SE and LITT has no negative impact on the structure and function of the gland. However, the absence of structural changes in the area of the scar and gland parenchyma indicates the high efficiency of treatment.

Conclusions

1. Studies have shown that the combined use of minimally invasive technologies, including SE and LITT in the treatment of cystic nodes cystic component with a volume of 20 to 80 % of total unit is effective and safe. It allows you to cure cystic node does not affect the function hormone production of gland and causes structural changes in the extranodular parenchyma.

2. Echogenicity nodes significantly affect the rate of regression of nodal tissue volume and residual scar. Yes, hypoechoic nodes respond intense increase in volume on the 1st day after the LITT, most regressed and replacement scar observed in most cases 3-6 months of observation. Jet izoechoic node swelling was less pronounced, and their replacement by connective tissue observed in the range from 3 to 15 months after the LITT. Regression node and volume of scar tissue does not depend on the age of patients and the percentage of unchanged thyroid tissue to treatment.

3. Predictors of efficiency and end of treatment is the presence or absence of land in punctate epithelial node or nodal parenchyma. Slowdown reverse development site and the presence of residual tissue in its cytological study are indications for a repeat of the SE or LITT.

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