The Test of Lugol Iodine Solution Associated with NBI Examination in Early Diagnostic of Tongue Carcinoma

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Tongue localization of squamous cell carcinomas is one of the most common sites of intraoral carcinomas, representing nearly 40% of these. The most frequent localization of the tumor is on the posterior lateral border and the ventral surface of the tongue. Recent papers have mentioned an ascendant trend in the incidence of tongue carcinoma in young adults. Early detection of the tongue carcinoma is mandatory because the prognosis of the patient depends on the early diagnostic. The aim of the paper is to analyze the use of lugol iodine solution staining in early diagnostic of tongue carcinoma. The authors propose a protocol for using lugol iodine solution in the screening of tongue carcinoma.

Keywords: tongue carcinoma, lugol-iodine solution, diagnostic

Head and neck cancers represent almost 3% of all cancer types [1.2]. The incidence of pharyngeal cancer in Romania is 15.5 (100,000), ranking third place in Europe. The mortality is 9.1 (100,000), again reaching the third place in Europe. The oral cancers represent 48% of all head and neck cancers, squamous cell carcinoma accounting for nearly 90% of the cases, more than 300.000 new cases being discovered around the world. More than 40% of the oral cancer cases are located on the tongue. The most common location is at the posterior-lateral and ventral border of the tongue. The floor of the mouth is the second most common localization of the oral cancer.

Recent studies have shown an increasing trend in the incidence of tongue cancer in young adults. The risk factors for tongue cancer are: tobacco, environmental exposure, alcohol and drug abuse. Tongue cancer has high mortality rates, of approximately 9000 deaths yearly.

The American Cancer Society recommends a screening protocol to be applied for all head and neck cancers. Asymptomatic patients with ages between 20 to 40 years should be scanned once every 3 years. Asymptomatic patients with age after 40 years should be scanned once per year. High risk patients as smokers and alcohol users should be scanned yearly no matter what their age is.

Visualization of suspect lesions as alteration of the surface, oral leukoplakia or squamous cell carcinoma on the tongue surface is sometimes difficult in early stages.

The aim of the paper is to propose a new protocol for early diagnostic of the tongue cancer. The clinical evaluation of the protocol is discussed. A minimally invasive solution to increase the contrast during high resolution endoscopic examination is proposed. Also, the clinical importance of the proposed method is evaluated.

Experimental part

Early diagnostic of tongue cancer is sometimes difficult to obtain. The lesions of the tongue are not always located in a visible part of the oral cavity. The lesions are located at the posterior-lateral and ventral border of the tongue. Sometimes these lesions are not visible during conventional oral examination.

A complete evaluation of the tongue is done by using bucopharyngoscopy and a videofibroscopic examination. [3].

We propose a protocol that includes staining with Lugol iodine solution. Lugol iodine solution was previously used as an antiseptic solution. The color enhancement method is based on the colorimetric determination of glycogen, using iodine method.

The Lugol iodine solution formula is formed by two grams of iodine, four grams of potassium iodine in 100 cc of distilled water. The color enhancement of the lesion is based on the reaction between the tumoral areas that contain glycogen and the Lugol. The tumoral areas will turn brown or black. The normal area that does not contain glycogen will remain colorless or will turn to yellow. Glicogen is a highly branched structure, homopoly-saccharide made from repeated α-D-glucose units. In contact with iodine it will produce a color reaction, so that the target area will turn to black or brown [4, 5].

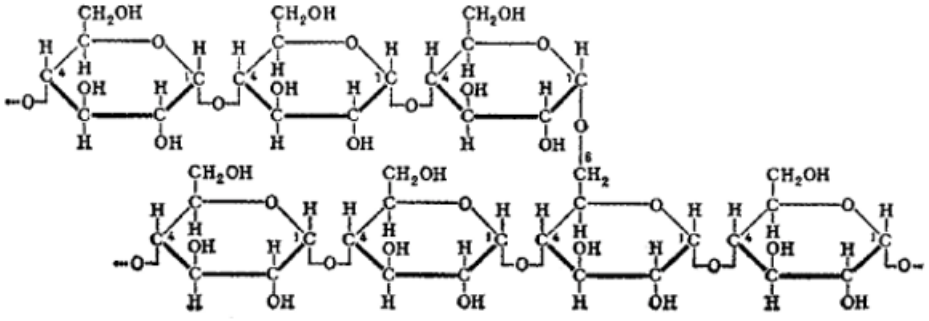

Fig. 1. Glycogen molecule - glucose radicals are joined by 1,4-glycoside bonds, at the branching point, and by a 1,6-glycoside bond

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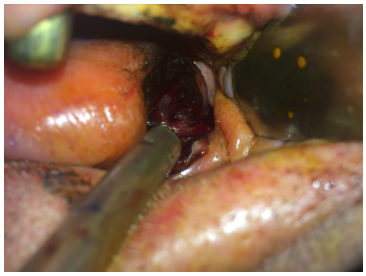


Fig. 2. Tumor of the tongue – examination after staining with Lugol iodine solution

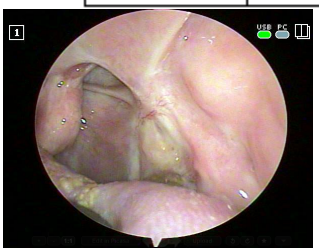
Fig. 3. Intraoperative image – resection of the tongue tumor

Fig. 4. Tongue tumor – resection piece

Table 1

STUDY RESULTS (COMPARISON BETWEEN THE RESULT OF LUGOL IODINE STAINING AND THE BIOPSY)

Bioptic rezult	Normal histological findings	Mild dysplasia	Severe Dysplasia	Squamous cell carcinoma
Male	1 - False positive	1	2	22
Female	0	0	1	3



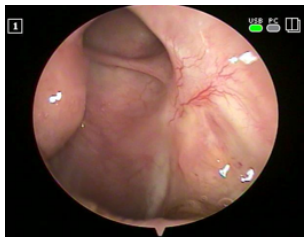


Fig. 5 and 6. Postoperative examination – 1 year post-radiotherapy, same patient – no sign of recurrence.

The examination proposed protocol consists of:

A. a test for allergic reaction to iodine;

B. a bucopharyngoscopic examination with white light and no staining;

- the second step consists of staining the tongue with 3% lugol iodine solution. The lesions showing brown stains are considered positive. Lesions that do not contain stains are considered negative. The same examination is repeated for the base of the tongue;

- a trans nasal fiberoptic examination and/or transoral rigid endoscopic examination with a 70^0 rigid rod after staining the tongue with 3% Lugol-Iodine solution;

- associating Lugol-Iodine test with an NBI examination for a higher percentage of tumor detection;

- if found, any lesions that are considered positive will be excised and sent for histopathological examination.

The selective staining method is based on the fact that inflammatory or carcinomatous epithelium will have an increased quantity of glycogen in contrast with the normal epithelium, where the glycogen content is low.

We examined using this protocol a number of 30 patients with suspected lesions of the tongue. The patient ages were between 32 and 65 years old. We had 4 females and 26 male. We compared the result of the biopsy with the aspect on lugol iodine staining.

Results and discussions

We placed the results of the study in the following table:

For the male group we obtained the following results after comparing the staining results and the biopsy findings: 1 patient had a positive result at lugol iodine staining that was not confirmed by biopsy. One patient had a biopsy result of mild dysplasia, two patients had severe dysplasia and squamous cell carcinoma was confirmed in 21 patients.

For the female patients the results were: one patient with severe dysplasia and 3 patients were confirmed by biopsy with squamous cell carcinoma.

Conclusions

Lugol iodine solution staining test is a minimally invasive, simple and inexpensive test that provides high sensitivity. Lugol iodine solution is a low cost substance with antiseptic properties. Due to the reaction with glycogen it has low false negative results.

The disadvantages of lugol iodine solution staining test are that it can be sometimes irritant and can cause allergic reactions in some patients up to the point of inducing shock. The staining is less accurate in post-menopausal women.

The lugol iodine staining test must be used routinely in heavy smokers and drinkers, considered a group of so-called *high risk* patients.

The lugol iodine staining test can be useful in early diagnostic of premalignant and malignant lesions of the tongue. Early diagnostic of those lesions will determine the surgical method of choice; the surgeon may use minimal invasive surgical techniques with low morbidity and decreased hospitalization time and costs. The early diagnostic of the tongue lesion will impact the survival of the patient.

Further studies may be necessary to determine if the test results can be improved if used NBI (narrow band imaging) light during bucopharyngoscopy and fiber optic endoscopic examination.

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