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RADIO-GUIDED SURGERY IN BREAST CANCER

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Summary

According to current literature, sentinel lymph node identification technique is a simple procedure that allows predicting the location of the axillary lymph nodes without under-staging neoplastic disease.

In clinical practice, the radio-guided surgery has been spreading also to diagnose the occult malignancy, giving space to the nuclear method for those injuries that, with a lot of difficulties for all the team's specialists, were detected using a guide-wire.

Currently the Radio-guided Occult Lesion Localization (ROLL) has become the choice procedure for all small lesions. Therefore, dedicated centers for study and treatment of breast disease use ROLL and Sentinel Node and Occult Lesion Localization (SNOLL) to resolve in a single surgery both breast disease and axillary nodal spread.

For this reason, the authors intend to prove, through this work, the idea that this method should be applied routinely in the current clinical practice of all operative units

Introduction

In recent years, the spread of breast cancer screening programs and the improvement of diagnostic methods have increased the percentage of breast lesion identifications at an early stage. This has resulted in an evolution of breast surgery and in the spread of an increasingly conservative and minimally invasive approach.

In this context, the study focuses on the use of radio-guided surgery for identifying sentinel lymph node (SLN) and locating non-palpable breast lesions.

The results of several Prospective randomized trials (PRTs), reported in the recent literature, show the actual reliability of localization and Sentinel Lymph Node biopsy (SLNB) methods for predicting the status of axillary lymph nodes (ALN) in patients with breast cancer, when specific indications are found (1, 2-5). Among the different methods used for studying the SLNs, the most recent series report better results, in terms of reliability, for radioactive tracer in comparison with the vital dye procedure (94-99% vs. 65-90%) (2, 6-10).

Clinical benefits may justify the higher costs and other issues concerning radio-guided procedures (1, 11, 12).

However, some studies often report the combination of both methods. In the presence

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of breast cancer at an early stage, it is possible to proceed by performing an axillary lymph adenectomy (ALA) based on the intra-operative histological results of the SLN, thus avoiding a large number of axillary dissections of pN0 lymph nodes with a significant reduction of the transitional and/or permanent complications.

The literature reports 65-70% of pN0 axillary dissections in patients with tumors equal or less than 2 cm, while the morbidity of the ALN level I and II dissections ranges between 3.5 and 12% (4, 13, 14).

The well standardized and routine use of the radiotracer for visualizing and identifying the SLN, with excellent results, have favored the spread of radio-guided surgery. The method has had an impacton all the centering procedures for mammographic or ultrasound non-palpable lesions suspicious for carcinoma in the early stage, such small groups of microcalcifications (clusters), opacities with spiculated borders and parenchymal distortion areas.

These areas, under either ultrasonic or stereotactic mammographic guidance, are centered by inoculating the radiotracer within the lesion and then surgically removing it after identification through the special probe for gamma ray detection.

This procedure requires a multidisciplinary team specialized for breast surgery, so it is desirable to identify the "breast unit" where collaboration among surgeon, nuclear physician, radiologist and pathologist is well standardized.

The learning curve for the surgeon working in a breast unit consists in identifying SLN and performing ALA, regardless of histological examination of the SLN, with an identification rate of no less than 90%, and less than 3-4% of false negatives (15, 16).

This work focuses on the need to demonstrate the best approach for treating this disease and to confirm, in the light of the international literature, that it is advisable to treat breast cancer in dedicated operative units where a multidisciplinary approach is available.

Radio-guided sentinel limph node biopsy (RSLNB)

This method is indicated in the presence of all the lesions not exceeding 3 cm, identified as infiltrating carcinoma using a needle biopsy, cytological positivity or suspicion after needle aspiration. Also, suggestive a result for cancer is when ALNs are not clinically appreciable.

Contraindications for this procedure are the presence of multicentric lesions, pregnancy, breast-feeding and carcinomalager than 3 cm, due to high incidence of axillary metastases (55-65%) and risk of having a lymph node jump.

On the contrary, the presence of clinically palpable axillary lymph nodes is the main indication for a complete axillary dissection.

In cases in which an excisional biopsy is carried out, and the lesion is found to be malignant, there is no contraindication for performing an identification of the SLN with the inoculation across the surgical scar.

The radiotracer commonly used for identification of the SLN is made of 99mTc-human serum albumin nanocolloidal particles, with a size between 20 and 80 nanometers. These dimensions are less than those of tracers administered intravenously to allow the radiotracer a rapid migration within the lymphatic system.

Although lymphatic drainage patterns from the tumor site cannot be standardized in its course, the mammary gland and the overlying skin may be considered a biological unit in which the lymphatic vessels tend to follow the course of blood vessels.

Furthermore, considering the relative structural disorder of neoplastic lymph nodes, the peri-tumoral or sub-dermal injection of the tracer is preferred to the intra-tumoral one.

Lymphoscintigraphy is an essential stage of the SLN technique, because the lymphoscintigraphic images help the surgeon in finding SLN intraoperatively. This procedure may be carried out the night before or the same day, 3-4 hours before surgery, and finally with the help of a nuclear doctor the cutaneous projection of the SLN is localized and marked with a demographic pencil. The probe for de-

tecting gamma rays, used intraoperatively, converts the radioactivity of SLN into a digital or acoustic signal (17).
Surgical biopsy: in patients where the cancer is located in the upper-outer quadrant, SLN biopsy can be performed across the same incision used for the resection of the tumor. In other cases, the skin incision is made along the back edge of the front pillar of the armpit (18).
In cases where the method of localization used was the vital dye, locating the SLN is performed by using blue colored lymph vessels following them up to the first draining lymph node, which appears blue colored as well. When the radioactive tracer procedure is carried out, the SLN is located through the appropriate probe for radio-guided surgery, which, moved slowly into the surgical field, allowing to identify the lymph node emitting the largest signal (19).

ROLL (Radio Occult Lesion Localization)

The term ROLL means the radio-guided localization of non-palpable lesions.
The method is ideal for clusters of microcalcifications, small opacities, radial scars and parenchymal distortions. It offers several advantages: precise localization of the lesion, easy surgical biopsy, ability to immediately check if there are residues in the lesions.
The main objectives of the ROLL technique are the following: the lesion must be located at the center of the parenchymal area that is removed, the surgical excision must be completed with sufficient intact resection margin, in order to avoid re-operations, and the ability to analyze a surgical specimen for ensuring that the injury is completely removed.
The application of the method has same absolute contraindications. It should not be applied for multi-center and retroareolar lesions,because of a potential risk of tracer diffusion and, thus, contamination of the lactiferous ducts.
The radioactive tracer consists of nm10 to 150 human albumin macro-aggregates labeled with 99Tc. It is a radioactive tracer that does not migrate through the lymphatic tissue; the site of inoculation is intra-lesional; 0.2 ml of the solution has to be inoculated under either stereotactic mammography or ultrasound guidance into the center of the suspicious lesion.
Simultaneously with the radiotracer, a very small volume (0.1-0.2) of iodinated contrast medium (Iomeron®), is administered to allow the subsequent mammographic verification. In nuclear medicine scintigraphic verification is performed on the area of inoculation. The main steps of the surgical technique are the following: skin incision, introduction of the probe, removal of disease, considering that the point of maximum uptake corresponds to the center of the lesion.
Progressively moving the probe a few millimeters towards the edge of the defined area, the signal gradually weakens and finally disappears. The surgeon will be able to define the extent of surgical resection, verifying the absence of residual uptake, and demonstrating that the lesion has been entirely removed. The radiogram of the surgical specimen is essential to verify that the lesion was excised with a proper distance from the edge of the section.

Conclusions

The procedure for identifying SLNs, in accordance with all studies reported in the literature, is a simple and well standardized procedure that allows predicting the location of ALN without under-staging the disease.
Clinical results of international reports with large series in which the method has been applied, unequivocally show that the SLN procedure is reliable. Having a "close-knit" multidisciplinary team avoids unnecessary ALA and thus reduces all its side effects, especially for small tumors where the rate of axillary metastasis is very low.
Moreover, the correct application of the method involves only a small percentage of false negatives (less than 3%). In the cases ofSLN false negatives, there are several possibilities for a therapeutic approach: re-operation with complete axillary dissection, axillary radiotherapy or close clinical check (6, 20).
The radio-guided surgery has also been used in occult malignancy, giving space to the nuclear method for the injuries

that, with a lot of difficulties for all the team's specialists, were removed with a wire guide. The ROLL has become the choice method for all small lesions.Whereas, dedicated centers use SNOLL for the study and treatment of breast disease,to solve breast neoplastic pathology and axillary lymph nodes spread, simultaneously.
Finally, all patients suffering from this disease should be treated in dedicated high volume "Breast Unit" centers, by a multidisciplinary team with a conservative and minimally invasive approach,which must take into account the suitable use of ROLL and SNOLL surgery.

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