Long-term outcomes after ROLL lumpectomy

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Abstract

Background Occult breast lesions are being successfully targeted by means of Radioactive-guided Occult Lesion Localization (ROLL). Several reports demonstrate suitability of ROLL technique to excise non-palpable breast lesions with immediate advantages.

Aim Evaluation of long-term outcomes after ROLL guided lumpectomy for early breast cancer.

Materials and methods A consecutive series of non palpable early invasive breast cancers excised with ROLL (151 pts; December 2002–June 2006) were followed up for long-term outcomes, i.e. local and/or systemic recurrence. Our follow-up protocol included 6 monthly physician administered clinical examinations and 18 monthly imaging, i.e. mammogram. Bone scan, liver and brain imaging were requested on clinical need. Clinical and/or radiological suspicious lesions for local recurrence were confirmed pathologically.

Results The median follow-up was 46 months with all patients having a minimum 22 months follow-up. 3/151 local recurrences occurred (1.98%).

Conclusions Long-term outcomes, i.e. local recurrence of invasive breast cancer excised with ROLL guidance compares well with existing localization techniques.

Keywords ROLL · Lumpectomy · Localization · Radioisotopes · Breast cancer · Recurrence · Long-term outcomes · Local recurrence

Introduction

Impalpable breast cancer is increasingly being detected due national use of breast screening programs. Several localization techniques to guide surgical excision have been reported:^{1,2} among them, Radioactive-guided Occult Lesion Localization (ROLL) is gaining popularity due to several previously reported advantages.^{3–8} ROLL was shown to be associated with a reduced excision volume and more accurate centricity of lesion within the surgical specimen.^{3,8} ROLL is a quicker, more accurate and patient-friendly technique, which provides better cos-

metic results and a higher percentage of tumor-free margins.⁹

An online literature search (Pub Med) using terms: ROLL, long-term outcome, radioisotope localization, breast cancer and recurrence was performed and few reports were noted. We have analyzed our consecutive prospective series and hereby report the recurrence rates.

Materials and methods

ROLL excision for impalpable breast cancer is in practice at our breast unit since December 2002. All core biopsy

proven but impalpable cancers are localized prior to surgery. An injection of 0.2 ml injection of ^{99m}Tc ($t/2 = 6$ h) suspended in macroaggregate of albumin was performed 1–4 hours prior to but on the day of surgery. It contained approximately 90,000 particles and had a particle size of 10–90 μm . The radioactivity administered was 1 MBq equal to 0.02 msv (i.e. the same dosage as for a chest X-ray). At surgery, center of the target lesion identification was facilitated by gamma probe. An intense persistent high pitched audible signal of radioactivity as detected with gamma probe was used (Fig. 1) to guide excision biopsy.

Satisfactory excision of the target tissue confirmed with a specimen X-ray (Fig. 2). The abnormality in the specimen should correlate with suspicious abnormality in the mammogram (Fig. 3).

Fig. 1 Gamma probe guided excision

Fig. 2 Bull's eye appearance

Fig. 3 Mass lesion

Cavity thus created after excision checked for any residual radioactivity (Fig. 4). Absence of residual audible signals using gamma probe indicates excision of target tissue.

Our aim is to remove the target lesion with 1 cm of healthy breast tissue all around; this is followed by selective shaving of the cavity. All specimens were marked with standard marking stitches (Fig. 5) to orient the specimen for pathological assessment.

Patients with positive margins (tumor cells within 1 mm excision margin) and positive cavity shavings (tumor cells in cavity shaving) were offered re-excision. Patients having completed at least 22 months clinical follow-up from first cancer surgery are included in the study. The breast-sparing procedure was followed by standard external beam adjuvant radiotherapy (45 Grey over 6 weeks course).

Our unit follow-up protocol included: clinician administered 6 monthly breast examinations and 18 monthly mammograms; chest X-ray, bone scan and haematochemical evaluation were performed when clinically indicated. Brain or liver imaging was under-taken when clinical or biochemical suspicion arose. Lesions clinically or radiologically suspicious for local recurrence were pathologically evaluated. The occurrence of systemic recurrence detected on imaging was not necessarily confirmed with a pathological diagnosis. Information regarding

Fig. 4 Probe checking for residual radioactivity

Fig. 5 Standard marking stitches after lumpectomy

Table 1. Characteristics of cancers excised with ROLL

Variables		ROLL (151 pts)	
		No.	%
Side	Right	69	45.6
	Left	82	54.3
Size (mm)		15	
Range (mm)		(2–7)	
Tumor volume (V_t) (cm ³)		1.766	
Specimen volume (V_{exc}) (cm ³)		96.00	
Surgeon grade	Consultant	110	72.8
	Non-consultant	41	27.1
Tumor grade	Grade I	38	25.1
	Grade II	89	58.9
	Grade III	24	15.8
Excision margins	Positive	18	11.9
	Negative	123	88.1
Redo surgery	Yes	16	10.5
	No	141	93.3
T	1	114	75.4
	2	34	22.5
	3	3	1.9
	0	104	68.8
N	1	27	17.8
	2	9	5.9
	3	1	0.6
	No record	10	6.6

$$V_t = (\pi/6)d^3, V_{exc} = \text{length (cm)} \times \text{width (cm)} \times \text{height (cm)}$$

Table 2. Type of cancer recurrence

Recurrence	ROLL (151 pts)	
	Number	%
Local	3	1.98
Local only	1	0.66
Local + systemic (lung)	2	1.32
Systemic only	3	1.98
Lung + liver	2	1.3
Brain	1	0.6

any intervention performed on detection of local recurrence (i.e. re-excision, mastectomy, and chemotherapy or radiation therapy) was retrieved from clinical files.

Local recurrence is defined as the development of a lesion of a similar biological type within the same index quadrant and within 3 cm from the original surgical scar.¹⁰ Data were numerically coded using Microsoft access database tool. Statistical analysis was carried out with SPSS 14.0, SPSS Inc, and Chicago, Illinois.

Results

One hundred and fifty-one impalpable invasive cancers were excised with ROLL (December 2002–June 2006).

Median age was 59 years (32–84). Cancer characteristics are presented in Table 1.

Median time to follow up was 33 months (IQR: 22–44 months). Median size of the excised primary was 15 mm. The theoretical tumor volume (v_t) was computed using the formula $V = (\pi/6)d^3$, where d is the maximum histological diameter of the tumor. The volume of the excised specimen (V_{exc}) was computed as the product of 3 dimensions (height $\times$ width $\times$ length) as recorded in the histology reports. The median tumor volume was 1.7 cm³. The median volume of the excised specimen was 96 cm³. The proportion of positive margin was 11.9% (18 pts) and the rate of redo surgery was 10.5% (16 pts). Of these, 11 underwent redo wide local excision while 5 had mastectomy. A cavity re-excision was the most commonly performed second surgery. Two patients opted for observation instead of redo surgery.

When a local recurrence was suspected clinically or on imaging, 14 patients underwent a fine-needle aspiration while 3 had a core biopsy. Local recurrence was confirmed in only 3 patients (1.98%).

The pattern of recurrence observed is described in Table 2: one patient presented with a local recurrence only, and 5 patients presented with systemic recurrences; this includes 2 patients with local recurrence.

Primary cancer biology and features of recurrence are described in Table 3. Time to local recurrence was: 6, 11

Table 3. Primary cancer biology and recurrence

ID	Size (mm)	Primary cancer histology				Recurrence				
		T	N	Grade	LVI	Margins	LR*	Months	SR*	Months
#1	22	2	1	3	Yes	+	Yes	6	Yes	14
#2	70	3	3	3	Yes	+	Yes	17	Yes	18
#3	2	1	2	3	Yes	–	Yes	11	No	–
#4	25	2	2	3	No	–			Yes	9
#5	20	2	0	2	No	–			Yes	16
#6	15	2	0	2	No	–			Yes	3

LR, Local recurrence; SR, systemic recurrence; LVI, Lymphovascular invasion

and 17 months, time to systemic recurrence was: 3, 9, 14, 16 and 18 months. All recurrences (i.e. local or systemic) occurred within first 24 months. Two-thirds of local recurrences occurred when the excision margins were involved.

The patient with local-only recurrence was offered a mastectomy; all other patients presenting with systemic (3 patients) or systemic and local recurrence (2 patients) were offered systemic palliative therapy.

Discussion

Early non-palpable breast cancer detection is on the raise due to screening mammograms.¹⁸ Time tested and widely practice technique is wire-guided localization (WGL). However, WGL is associated with several drawbacks.^{3,11} Hence, several alternate techniques are being

reported^{21–23} but none have reported any of their long-term outcomes.

ROLL guided excision since its development is shown to have many immediate advantages.^{3,9,11–13} In this series we report long-term outcomes, i.e. local recurrence rates. With the ROLL technique, breast cancers can be adequately excised with 89.1% negative margins rate. The early recurrence (i.e. within 1 or 2 years after surgery) is often an indicator of aggressive disease.^{19,20} In our series all recurrences were within the first 24 months of follow-up. Among the three patients with local recurrences, cancer biology of 2 were aggressive (high grade, lymphovascular invasion, regional nodal disease), and they went on to develop systemic recurrence within months of local recurrence as reported before. ROLL guided excision long-term results are favorable as shown in this study but similar results is needed to be replicated in a larger series with a longer median time to follow up.

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