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Sentinel Lymph Node Study: Its Significance In Colorectal Cancer.

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ABSTRACT

Background: Intraoperative SLNB using methylene blue is technically simple and quick (usually within 10 minutes of operating time) procedure. It allows the pathologist to focus attention on a limited number of nodes (1- 5) for detailed focused analysis, which saves time and is less costly. **Methods:** Acolonoscopic biopsy-proven diagnosis of clinical stage I and II colon or rectal cancer, were prospectively studied. A standard oncological en-bloc resection of the neoplasm and the regional LNs was then performed. The SLNs (sentinel lymph node biopsy) were dissected from the surgical specimen immediately after the completion of the operation and were sent separately to the pathology department together with the specimen. The SLNs were submitted in their entirety for microscopic examination. **Results:** SLNB is highly accurate because it accurately predicts the regional lymph node status in 92.85% of cases. The absence of metastases in the SLN accurately predicts the status of the non-SLNs 85.7% of the time. **Conclusion:** SLNB improves the staging of patients with colon cancer by upstaging 14.29 % of patients, who may benefit from further adjuvant chemotherapy.

Keywords: Colorectal Cancer, Sentinel Lymph Node.

INTRODUCTION

Globally colorectal cancer is the third most common cancer in males and the second in females.The most important prognostic factor in CRC is the stage of the tumor at the time of initial diagnosis and the presence of lymph node (LN) metastases decreases the 5-year survival by approximately 20% to 30%.Surgery remains the only curative option but adjuvant chemotherapy (CT) has been shown to improve survival in patients with positive lymph nodes (LNs) (i.e. Stage III CRC). Accurate identification of LNs involved by metastases is thereby of vital importance as it facilitates decision-making with regard to adjuvant systemic therapy. The role of SLNB(sentinel lymph node biopsy) in CRC is not to decide on the extent of lymphadenectomy but to increase the histological yield of positive LNs following standard radical resection. Detection of malignant involvement of LNs outside the traditional drainage area and resection line is another potential use of SLNB. The purpose of this study was to validate the feasibility of SLNB in patients with CRC.

MATERIALS AND METHODS

All patients, from June 2014 to June 2016, with a colonoscopic biopsy-proven diagnosis of clinical stage I and II colon or rectal cancer, were prospectively studied under an Institutional Review Committee approved Protocol after obtaining informed consent. Patient characteristics, including age, sex, and tumor location, were documented. Preoperative staging evaluation was done with physical examination including digital rectal examination, laboratory studies (including blood chemistry and carcinoembryonic antigen (CEA), liver function tests), fecal occult blood test (FOBT), chest x-ray, computed tomographic scan of the abdomen and pelvis (CT Scan), and colonoscopy in all patients. Transrectal ultrasound was not routinely done.

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Inclusion Criteria

1. Colonoscopic biopsy-proven diagnosis of colonic or rectal adenocarcinoma
2. Clinical Stage I or Stage II resectable disease
3. No evidence of Distant Metastasis
4. Performance status of less than or equal to 2 on the Eastern Cooperative Oncology Group (ECOG) scale

Exclusion Criteria

1. Patients requiring emergency surgery (such as for malignant bowel obstruction, perforation)
2. History of Crohn disease, chronic ulcerative colitis, familial polyposis, intestinal tuberculosis, autoimmune diseases
3. Prior history of malignancy (including colorectal malignancy), irradiation or prior abdominal surgery
4. Patients found to have metastases intraoperatively

Surgical Technique

All of the patients were approached via open surgical procedures such as anterior resection (AR), abdomino-perineal resection (APR) and segmental resection and end-to-end anastomosis or hemicolectomy. Patients were brought to the operating room, where an exploratory laparotomy was performed. The location of the primary neoplasm was confirmed together with assessment of the extent of the primary tumor and any distant metastases were excluded. None / barest minimal dissection to allow peritumoral injection was done.

Once the primary lesion was identified, 0.5 mL of 1% Methylene Blue was injected into the bowel wall subserosally circumferentially around the primary tumor at 4 sites (total 2 ml) by using a tuberculin syringe. Care was taken to ensure that there was no injection into the lumen of the bowel. Proctoscope was used to inject the dye on the distal aspect in rectal cancers submucosally.

The blue dye travels quickly via the lymphatics to the draining LNs, which turn pale to deep blue. Within the first 10 minutes after injection, the first to fifth nodes closest to the tumor, that were highlighted with blue dye against a background of yellow mesenteric fat were identified as the SLNs and were marked with silk sutures.

A standard oncological en-bloc resection of the neoplasm and the regional LNs was then performed. The SLNs were dissected from the surgical specimen immediately after the completion of the operation and were sent separately to the pathology department together with the specimen. The SLNs were submitted in their entirety for microscopic examination.

Pathological Analysis

The surgical specimen was dissected manually to identify other LNs contained in the mesenteric fat. No chemical clearance method was used.

After resection of the specimen, the tagged LNs were excised and separately processed to further examination as SLNs. Thereafter, as many non-sentinel lymph nodes (NSLNs) as could be identified, were dissected from the specimen (aiming at a minimum of 12 lymph nodes as recommended by the UICC/AJCC).

Analysis of SLNs

All the SLNs were bisected and embedded in paraffin. Single section was routinely performed. Slices were stained by H&E staining. If the result was negative, all SLNs paraffin blocks were sectioned at 20 micron intervals to five slices 4 microns thick and stained by H&E in the second step of pathological evaluation.

Analysis of non-SLNs

All non-SLNs were bisected and embedded in paraffin. Single section was routinely performed and stained by H&E staining.

Analysis of Specimen

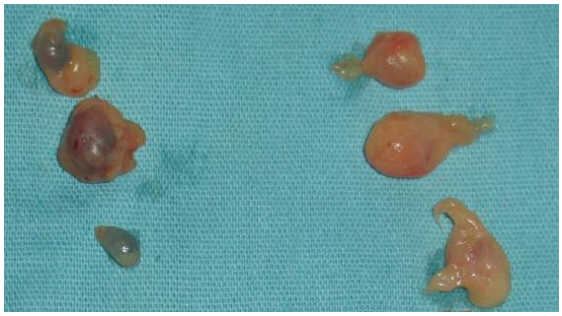
Standard processing of the tumor included reporting the tumor size and grade, T stage, and surgical margin status. The number of nodes, and the number of positive nodes were recorded. Tumor deposits within LNs were classified and staged according to the revised guidelines set by the AJCC and UICC. Tumor status in SLN was compared with the status in all other harvested regional nodes for each patient.

RESULTS

Table 1: Characteristics of Patients and Interventions

General Parameter	Value (%)
Total No. of Patients	17 (100%)
Male [No. (%)]	10 (58.8%)
Female [No. (%)]	7 (41.2%)
Age (yr) [mean (range)]	53.1 (36 – 86)
Tumor Distribution	
Colon [No. (%)]	8 (47.1%)
Right Colon [No. (%)]	4(23.5%)
Descending Colon [No. (%)]	1(5.9%)
Sigmoid Colon [No. (%)]	3 (17.7%)
Rectum	9 (52.9%)
Operative Procedure	
Right Hemicolectomy [No. (%)]	4 (23.5%)
Left Hemicolectomy [No. (%)]	1(5.9%)
Segmental Colectomy [No. (%)]	3 (17.6%)
Abdominoperineal Resection [No. (%)]	8 (47.1%)
Resection & Hartman's [No. (%)]	1 (5.9%)
T-Stage	
T1 [No. (%)]	0 (0%)
T2 [No. (%)]	4 (23.5%)
T3 [No. (%)]	6 (35.3%)
T4 [No. (%)]	7 (41.2%)
Grade	
G1[No. (%)]	5(29.4%)
G2[No. (%)]	11(64.7%)
G3[No. (%)]	1 (5.9%)
G4[No. (%)]	0 (0 %)
Nodes	
Sentinel Nodes[No. (%)]	28 (21.2%)
Positive[No. (%)]	9 (32.1%)
Non-Sentinel Nodes[No. (%)]	104 (78.8%)
Positive[No. (%)]	31 (29.8%)
Number of Sentinel Nodes	

0[No. of cases (%)]	3 (17.6%)
1[No. of cases (%)]	5 (29.4%)
2[No. of cases (%)]	6 (35.3%)
3[No. of cases (%)]	2 (11.8%)
>3[No. of cases (%)]	1 (5.9%)



Blue stained SLNs on the left and non-blue NSLNs on the right.

Table 2: Showing Nodal and SLN Detection and Positivity per case in relation to Age of CRC patients

Age (Years)	No. of Cases	No of Cases with Positive SLNs	No. of Nodes (Per Case)	Positive Nodes (Per Case)	No. of Sentinel Nodes (Per Case)	Positive Sentinel Nodes (Per Case)
31 – 40	4	3 (75%)	27 (6.75)	13 (3.25)	8 (2)	4 (1)
41 – 50	4	1 (50%)	22 (5.5)	4 (1)	3 (0.75)	1 (0.25)
51 – 60	5	2 (40%)	52 (10.4)	22 (4.4)	9 (1.8)	3 (0.6)
61 – 70	2	1 (100%)	15 (7.5)	1 (0.5)	3 (1.5)	1 (0.5)
71 – 80	1	0 (0%)	5 (5)	0 (0)	2 (2)	0 (0)
81 – 90	1	0 (0%)	11 (11)	0 (0)	3 (3)	0 (0)

The number of positive LNs per case as well as positive SLNs per case was more in patients below the age of 60 years (3 and 0.61 respectively) as compared to the higher age group above 60 years(0.25 and 0.25 respectively).

Table 3: Showing Nodal and SLN Detection and Positivity per case in relation to Tumor Location in CRC patients.

Site	No. of Cases	Total Nodes (Nodes per Case)	No. of Positive Nodes (Positive nodes per Case)	No. of SLNs (SLNs per Case)	No. of Positive SLNs (Positive SLNs per Case)
Colon	8	73 (9.12)	12 (1.5)	16 (2)	2 (0.25)
Rectum	9	59 (6.55)	28 (3.11)	12 (1.33)	7 (0.77)

The average number of nodes and SLNs were more in colon cancers (9.12 per case and 2 per case, respectively) in comparison to rectal cancers (6.55 per case and 1.33 per case, respectively) but average positive nodes and positive sentinel nodes were more in rectal cancers (3.11 per case and 0.77 per case, respectively) as compared to colon cancer cases (1.5 per case and 0.25 per case, respectively).

Table 4: Showing Nodal and SLN Detection and Positivity per case in relation to T-stage in CRC patients.

T-stage	No. of Cases	Total Nodes (Nodes per Case)	No. of Positive Nodes (Positive nodes per Case)	No. of SLNs (SLNs per Case)	No. of Positive SLNs (Positive SLNs per Case)
pT1	0	0 (-)	0 (-)	0 (-)	0 (-)
pT2	4	26 (6.5)	0 (0)	5 (1.25)	0 (0)
pT3	6	37 (6.17)	5 (0.83)	6 (1.00)	1 (0.17)
pT4	7	69 (9.86)	35 (5)	17 (2.43)	8 (1.14)

The average number of LNs as well as SLNs was more in pT4 patients in comparison to pT2 or pT3 patients. The average number of positive nodes as well as positive sentinel nodes increased with increasing T-stage.

Table 5: Showing Nodal and SLN Detection and Positivity per case in relation to Tumor Grade in CRC patients.

Tumor Grade	No. of Cases	Total Nodes (Nodes per Case)	No. of Positive Nodes (Positive nodes per Case)	No. of SLNs (SLNs per Case)	No. of Positive SLNs (Positive SLNs per Case)
G1	5	41 (8.2)	11 (2.2)	7 (1.4)	2 (0.4)
G2	11	83 (7.55)	29 (2.64)	19 (0.82)	7 (0.64)
G3	1	8 (8)	0 (0)	2 (2)	0 (0)
G4	0	-	-	-	-

The average number of LNs and SLNs were more in grade 1 patients than in grade 2 patients. grade 2 patients had more positive LNs and SLNs in comparison to grade 1 patients.

Table 6: Showing Nodal and SLN Detection and Positivity per case in relation to LVI in CRC patients.

LVI	No. of Cases	Total Nodes (Nodes per Case)	No. of Positive Nodes (Positive nodes per Case)	No. of SLNs (SLNs per Case)	No. of Positive SLNs (Positive SLNs per Case)
Absent	13	99 (7.62)	17 (1.31)	22 (1.69)	4 (0.31)

Present	4	33 (8.25)	23 (5.75)	6 (1.5)	5 (1.25)

The average numbers of LNs as well as SLNs were more in patients with lymphovascular invasion. The average number of positive SLNs were also higher in patients with lymphovascular invasion.

Table 7: Showing Nodal and SLN Detection and Positivity per case in relation to Tumor Size in CRC patients.

Tumor Size (cms)	No. of Cases	Total Nodes (Nodes per case)	Positive Nodes (Positive Nodes Per case)	No. of SLNs (SLNs per case)	No. of Positive SLNs (Positive SLNs per case)
0 – 3.0	1	5 (5)	0 (0)	1 (1)	0 (0)
3.1 – 6.0	13	92 (7.08)	22 (1.69)	23 (1.77)	7 (0.54)
6.1 – 9.0	1	14 (14)	3 (3)	2 (2)	0 (0)
9.1 – 12.0	1	6 (6)	0 (0)	0 (0)	0 (0)
12.1 – 15.0	1	15 (15)	15 (15)	2 (2)	2 (2)

The average number of positive LNs as well as positive SLNs were more with tumors of maximum size in this study.

Table 8: Showing the Nodal Positivity in Colorectal cancer cases in this study

Nodes	No. of Nodes	No. of Positive Nodes	Positivity
Sentinel Nodes	28	9	32.1% (9 of 28)
Non-Sentinel Nodes	104	31	29.8% (31 of 104)

Nodal Positivity of SLNs vs NSLNs
SLNs were more often positive as compared to non-sentinel nodes.

Table 9: Showing the Distribution of Positive and Negative SLNs in CRC cases in this study.

Variable	N
Total no of Patients	17
Total patients with SLN identified	14
Total patients with negative SLN (no evidence of metastases)	7
Total patients with negative SLN and positive non-SLNs	1
Total patients with positive SLNL (evidence of metastases)	7
Total patients with positive SLN on MLS (micrometastases only)	1

Sensitivity of SLNB to predict Metastases and False Negative Rate

Overall, 8 of 14 patients (50%) were found to have metastases (macrometastases or micrometastases) in SLNs or non-SLNs, and thus, were considered as node positive (pN1 or pN2). In 7 of these patients, the SLNs were positive for metastases resulting in a sensitivity (i.e. the probability of detecting tumor in an SLN when nodal metastasis is present) of 87.5% (7 of 8), whereas in the remaining 1 patient the SLN was not positive for macrometastases but metastases were found in non-SLNs, resulting in a false-negative rate (i.e. the probability of not finding tumor in a SLN when nodal metastasis is present) of 12.5% (1 of 8).

Identification of micrometastases by Multi-level sectioning of SLN

Out of 14 patients in whom SLNs were identified, macrometastases were identified in 6 of 14 patients with SLNs, one patient had no macrometastases in SLNs but macrometastases was present in Non-SLNs. The remaining 7 patients classified as node negative (N0) by routine H&E staining underwent multilevel sections of the SLN. One of these 7 patients revealed micrometastases (14.29%).

Accuracy

The accuracy to predict the nodal status by SLNB was 92.85% (13 of 14).

Negative Predictive Value

The negative predictive value for the prediction of the absence of metastases was 87.5% (7 of 8)

Aberrant Lymphatic Drainage

Aberrant lymphatic drainage could not be identified in any of our 17 patients.

Complications

There were no complications specifically related to the SLN technique in any of the 17 cases.

DISCUSSION

The prognostic significance of LN metastases in solid tumors is well known. LN metastases decrease the overall survival in CRC by about 30%. CRC patients with LN metastases are usually treated with adjuvant chemotherapy, with a reported reduction in cancer-related mortality by approximately 33%. Patients with AJCC stage I/II disease often are not treated outside a protocol study with adjuvant chemotherapy because of a lack of strong supporting data in the published literature. Unfortunately, 20% to 30% of these patients will experience recurrence of their disease and die of metastatic disease within 5 years of diagnosis, despite undergoing curative surgery. A likely explanation of this high mortality rate is that conventional methods may falsely underestimate micrometastatic nodal involvement in some patients, who may then not receive effective adjuvant chemotherapy and, consequently, may suffer from increased mortality.
A total of 17 patients, from June 2007 to June 2009 with a colonoscopic biopsy-proven diagnosis of

clinical stage I and II colon or rectal cancers were studied.

The in vivo dye injection technique used in this study was similar to Saha et al and Weise et al (but 1% Methylene blue was used in place of 1% isosulfan blue used by Saha et al and Weise et al). Care was taken to ensure that there was no injection into the lumen of the bowel. Within the first 10 minutes after injection, the first to fifth nodes closest to the tumor, that were highlighted with blue dye against a background of yellow mesenteric fat were identified as the SLNs and were marked with silk sutures. The SLNs were sent separately to the pathology department together with the specimen.

Studies have used isosulfanblue (1% Lymphazurin) , 1% methylene blue , carbon dye (India Ink), 10% fluorescein, radiolabeled colloids (99mTc-sulfur colloid in the United States, 99mTc-nanocolloidand 99mTc-antimony sulfide in Europe and Australia) either alone or in combination. In this study methylene blue was used as it is cheaper, does not cause hypersensitivity reactions and blue discoloration of urine and stool are temporary.

Some studies have recommended that blue dye and radio-tracer mapping be combined as this approach may yield a higher SLN identification rate (0 – 9.5%) than blue dye alone. Radio-tracer mapping is very expensive (prohibitively so in most developing countries), cumbersome (requiring time-consuming preoperative preparation and increased operating time), has no significant SLN detection advantage as single agent over blue dyeand may pose radiation risk. Besides, the proximity to the primary site could lead to a "shine-through" effect, reducing the sensitivity of the radioactivity of the SLNs.

In this study the surgical specimen was dissected manually to identify other lymph nodes contained in the mesenteric fat. Hermanek et al determined that the average number of nodes present in a standard colon resection after use of a fat-clearance technique was 47. Without the aid of a fat-clearance technique, the authors found 31 nodes on average. Although this number is almost one third less, it is still significantly greater than the mean of 7.7 nodes per patient in this study.The number of lymph nodes found by the clearance techniques ranges from 34 to 68 per surgical specimen. The higher number of lymph nodes discovered affords a higher possibility of detection of métastases.

Herrera-Ornelas et al studied metastases in small nodes from colon cancer and concluded that the use of clearance techniques in surgical specimens from colon cancer enhances pathologic staging by increasing detection of metastases in small lymph nodes. Lymph node métastases from colon cancer occur most frequently in small lymph nodes (< 5 mm). Lymph nodes 10 mm in diameter and larger can be found with nests of tumor cells lodged in the subcapsular area, but small lymph nodes were always found almost completely replaced with tumor.In this study, the SLN detection rate was more in colonic tumors (87.5%) in comparison to rectal tumors (77.7%), but this association was not statistically significant ($p > 0.05$). SLNB Sensitivity for metastasis was more in rectal tumors (100%) in comparison to colonic tumors (50%) but again this was not statistically significant ($p > 0.05$) . This can be due to more advanced cancers in the rectal cancer group (one pT2 tumor, three pT3 and five pT4 tumors) compared to colon cancer group (three pT2 tumors, three pT3 tumors and two pT4 tumors) .

In this study, the average number of nodes and SLNs were more in colon cancers (9.12 per case and 2 per case, respectively) in comparison to rectal cancers (6.55 per case and 1.33 per case, respectively) but average positive nodes and positive sentinel nodes were more in rectal cancers (3.11 per case and 0.77 per case, respectively) as compared to colon cancer cases (1.5 per case and 0.25 per case, respectively). This can be due to more advanced cancers in the rectal cancer group (one pT2 tumor, three pT3 and five pT4 tumors) compared to colon cancer group (three pT2 tumors, three pT3 tumors and two pT4 tumors).

Quadros et al (2008), using combined technique in 52 patients reported low rectal location (P=0.009) was an independent risk factor for inability to detect SLNs in multivariate analysis, using H&E, SS, and IHC.Shen et al (2009) reviewed clinicopathologic factors of 434 consecutive cases of CRC treated by surgical resection correlated with number of lymph nodes recovered and found that tumor location was associated with number of lymph nodes harvested. More lymph nodes were present in resection specimens of cecum/ascending colon and descending colon cancers than in those of transverse colon, sigmoid colon, and rectal cancers in multivariate regression analysis.In this study, the SLN detection rate was more in colonic tumors (87.5%) in comparison to rectal tumors (77.7%) but this association was not statistically significant ($p > 0.05$)., The average number of nodes and SLNs were more in colon cancers (9.12 per case and 2 per case, respectively) in comparison to rectal cancers (6.55 per case and 1.33 per case, respectively) but average positive nodes and positive sentinel nodes were more in rectal cancers (3.11 per case and 0.77 per case, respectively) as compared to colon cancer cases (1.5 per case and 0.25 per case, respectively).

Kitagawa (2002) studied 56 CRC patients with Tc-99m labeled colloid and H&E staining and had SLN DR and accuracy of 100% for patients with T1 or T2 primary tumors were as overall SLN DR was 91%. All the 4 false negative cases were advanced cases with T3 primary tumors.Broderick-Villa et al (2002) studied SLNB in 50 CRC patients using blue dye and H&E with CK-IHC(if negative by IHC), and found that tumor stage was not associated with higher false negative rate. In this study, the SLN Detection rate as well as SLNB sensitivity was

highest in pT4 tumors as compared to pT3 and pT2 tumors, though, not statistically significant ($p > 0.05$). There were no cases with pT1 tumors.The average number of LNs as well as SLNs were more in pT4 patients in comparison to pT2 or pT3 patients. The average number of positive nodes as well as positive sentinel nodes increased with increasing T-stage.Fang et al retrospectively studied 1127 CRC patients undergoing resection and found by univariate as well as multivariate logistic regression analysis that the lowering tumor histological differentiation was a statistically significant risk factor for lymph node metastasis.In this study, grade 2 tumors were most common (64.7%), with only one grade 3 tumor and no grade 4 tumor. SLN sensitivity was more in grade 2 patients as compared to grade 1 patients. This was however, not statistically significant ($p > 0.05$). The average number of LNs and SLNs were more in grade 1 patients than in grade 2 patients.

Bembenek et al (2007) studied 315 colon cancer patients using blue dye injection followed by SS and IHC if LNs were negative on routine H&E. LVI was positively associated with SLNB detection rate. In this study, SLN detection rate and SLNB sensitivity increased with the presence of lymphovascular invasion. This was however, not statistically significant ($p > 0.05$). The average numbers of LNs as well as SLNs were more in patients with lymphovascular invasion.Wolmark et al studied 670 colon cancer patients and 236 rectal cancer patients in NSABP prospective trials and found that there was no correlation between the longest diameter of the primary tumor and the status of regional lymph nodes for either colon or rectal cancer. Quadros et al (2008), using combined technique in 52 patients reported tumor size ($P=0.036$) was an independent risk factor for inability to detect SLNs in multivariate analysis, using H&E, SS, and IHC.In this study, the mean tumor size 5.79 (± 2.63) X 3.04 (± 1.08) cms and the range was 2.5 to 13 cms. Maximum SLNB sensitivity was seen in tumors with maximum size (100% and 12.1 – 15.0 cms, respectively). This was not statistically significant ($p > 0.05$). SLN detection rate however, was unrelated to tumor size.

In this study, a total of 132 nodes were harvested (7.7 per patient): 104 non-SLNs (6.1 per patient) versus 28 SLNs (1.6 per patient). The average number of SLN retrieved is within the range reported by other studies. The low overall average LN yield is possibly due to lack of use of fat clearing techniques which can increase the LN yield.Lim et al (2008), using combined technique identified a mean of 4 SLNs (range 0-13) in 120 colon cancer patients evaluated by H&E staining and IHC. Sommariva et al (2009), identified a mean of 5.0 SLNs per patient in study on 69 CRC patients.

Quadros et al (2008), using combined technique in 52 patients reported SLNDR of 90.9% in colon cancers and 63.3% in rectal cancers ($P=0.023$), using H&E staining, SS, and IHC. Overall, the SLNDR lies in the range of 70% to 100%.In this study, the SLN detection rate was 82.35% which is within the range of the reported literature. Some of the pitfalls that may account for an inadequate SLN identification rate include incomplete circumferential injection of the dye around the tumor, intraluminal rather than subserosal injections, large tumors that may require larger amounts of dye to achieve complete peritumoral injection, obstruction of the lymphatic channels in nodes that are completely replaced by tumor and therefore prevent adequate flow of the dye, and patients with previous colon surgery that may alter the lymphatic flow patterns. The 82.35% total SLN identification rate in our study is a reflection of the initial learning curve experience as well as advanced nature of lesions.

Previous studies using the SLNB have upstaged 0 – 53% patients with colorectal cancer from stages I and II to stage III, depending on the method of analysis used (H&E staining, MLS, IHC or RT-PCR singly or in combination).In this study, in which the SLN was the only node containing micrometastatic disease in 1 of 7 (14.29%) of patients undergoing MLS after being staged as node negative by routine H&E staining.

Overall, the accuracy ranges from 59% to 96%.The accuracy to predict the nodal status by SLNB in this study was 92.85% which compares favorably.Kelder et al (2007) studied in vivo SLNB using patent blue dye H&E and IHC in 69 Colon cancer patients. ALD rate 4% (3 patients).Overall ALD(aberrant lymphatic drainage) has been reported in 0% to 14% cases. The mapping agent should be injected near the tumor with as little mobilization of the colon as needed prior to injection. When the colon is significantly mobilized and at the extreme when lymphatic mapping has been performed ex vivo, vital lymphatics could easily be disrupted and aberrant lymphatics might never be identified. In this study, aberrant lymphatic drainage could not be identified in any of the 17 patients. If ALD is identified, a more radical surgical resection should be performed, to include a complete lymphadenectomy of the SLN-bearing nodal basin.

CONCLUSION

SLNB improves the staging of patients with colon cancer by upstaging 14.29 % of patients, who may benefit from further adjuvant chemotherapy. A selected group of patients staged as node negative by SLN biopsy, likely to be cured by the surgical intervention alone are spared from the toxic effects of chemotherapy.

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