

# A Study of Contractility of Proximal Surgical Margin in Esophageal Cancer

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## Abstract

**Background:** The marginal length from main tumor in esophageal cancer is a considerable issue regarding surgical management and adjuvant treatment; so we decided to study the contractility effect on the proximal surgical margin after immersing it in 10% buffered formalin as a fixative.

**Methods:** The proximal marginal length of ten sequential patients with esophageal cancer who underwent transhiatal esophagectomy were studied, on the operating table as fresh specimens, immediately after resection, and next 24, 48 and 72 hours after immersing in 10% buffered formalin.

**Results:** The contraction continued through the day 3, the mean contractility after one day was about 27%, after two days was 33% and after three days was 38%.

**Conclusion:** This study shows how the proximal esophageal margin can vary by the time, after immersing in 10% buffered formalin and should be considered in every settings and reporting documents by pathologists.

**Keywords:** Esophageal cancer; Marginal safety; Contractility

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## Introduction

Marginal status is an integral part of cancer surgery which will affect the surgical procedures as well as comprehensive patient management.

Margin status can affect on local or anastomotic site recurrence particularly, the proximal margin in esophageal carcinoma.

The importance of marginal length on the anastomotic site recurrence was mentioned by several studies.

In the study that was performed by Tam Pc *et al* in 1987, it is concluded that if the marginal length is less than 5 cm, the local recurrence rate is about 20%, if it is between 5-10 cm the recurrence is about 8% and if greater than 10 cm, the recurrence rate is 0% [1].

In another study in 1996 by Law S. *et al*, the tumor's distance from the margin was the main factor for the anastomotic site recurrence than microscopic involvement of the margin. If marginal length was less than 2.7cm, the anastomotic site recurrence was occurred and if the length was more than 4.4cm, there was no recurrence [2].

In other study in 1993 by Paul Dimusto *et al*, It was concluded that it is adequate to have 4-6cm length for distal margin (stomach) following resection and in 98% of cases it is usually free of tumor. In remaining 2%, microscopic involvement of the margin doesn't affect survival which is usually correlated with metastasis and more resections don't increase the improvement [3,4]. Here we reported the contractility effect on proximal margin length one, two and three days after immersing it in 10% buffered formalin as fixative.

## Materials and Methods

### Patients and specimens

Patients with esophageal cancer either squamous cell carcinoma or adenocarcinoma who underwent esophagogastric resection by transhiatal technique were included. During the year 2011, ten cases were studied. After resecting the specimen, it was laid freely on the table, one suture with 2-0 silk is made just at the operating table proximal to the palpable mass and another one is laid just at the resection margin. The interval between two silk sutures was

measured by metal ruler and recorded. Measurements was done by one staff after 24, 48 and 72 hours after immersing the specimen in a container which contains 10% buffered formalin that equals about 20 times the volume of the specimen.

**Results**

The absolute figure of contraction according to days was shown at Table 1.

After 24 hours, the minimal size of contraction was 4.5%, the maximal size was 50% and the average size was 27% (Figure 1). After 48 hours, the minimum was 14%, the maximum was 50% and the average size was 33% (Figure 1).

After 72 h, the minimum was 23%, the maximum was 51% and the average size was 38% (Figure 1).

**Discussion**

Esophageal carcinoma is the fourth and seventh most common cancers among Iranian women and men respectively; excluding skin cancer (Ministry of Health-Iran). This is more common in North of Iran which is also the most prevalent one in the world. The rate of SCC is still high consisting 75% of cases in men and 85% in women. Although the neoadjuvant chemotherapy is effective in SCC but surgical resection remained the main therapeutic approach which is performed by different approaches such as left thoracotomy, laparotomy, right thoracotomy and cervical incision through various techniques eg: Ivor

Lewis, McKawn, Radical esophagogastrectomy and Transhiatal esophagectomy depending on the location and stage of tumor [4]. In each technique, the minimum requirement for marginal length should be considered [5-8].

The length of margins from the primary tumor is one of the main criteria for complete resection which is reported by pathologist after fixation of specimen in 10% buffered formalin during the coming days. The margin length will change day by day after resection; in our study it became shorter 27%, 33% and 38% during 1<sup>st</sup>, 2<sup>nd</sup>, and 3<sup>rd</sup> day after fixation. As it was discussed by Tam PC and Law S, the length of margin is the most important prognostic factor for anastomotic site recurrence, so that the 10 cm with zero probability and the less than 5 cm about 20%. The length which is reported by pathologist differs from actual size. The actual size is the length of margin during pathology study plus the expected contractility of the specimen based on the day(s) which remained in the fixative material.

Some articles studied the length difference in vivo and after resection. This kind of study is very difficult in transhiatal technique and thus omitted [5].

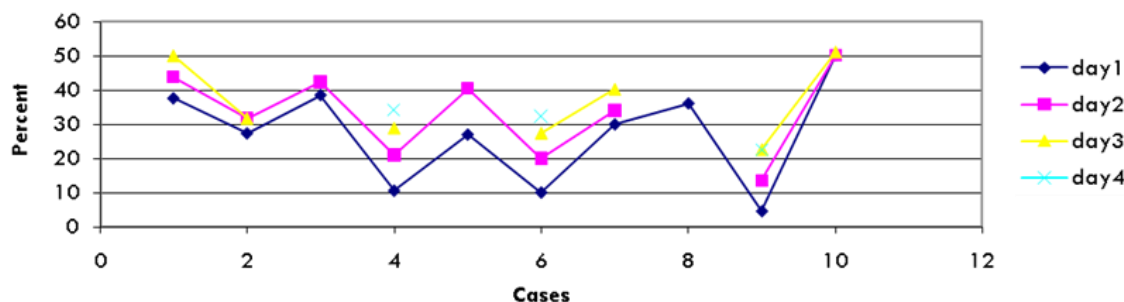
Regarding ongoing contraction even in 10% buffered formalin, every statement about margin should be correlated to the time of reporting. You can reach the actual size by  $X=Y+(Y \times Z/100)$

X=Actual size

Y=Margin length after immersing in formalin

**Table 1.** Length of contraction according to days

Cases	Just after resection(cm)	Day 1 (cm)	Day 2 (cm)	Day 3 (cm)	Day 4 (cm)
1	8	5	4.5	4	-
2	11	8	7.5	7.5	-
3	13	8	7.5	-	-
4	19	17	15	13.5	12.5
5	5.2	3.8	3.1	-	-
6	20	18	16	14.5	13.5
7	9.7	6.8	6.4	5.8	-
8	12.5	8	-	-	-
9	2.2	2.1	1.9	1.7	1.7
10	10	5	5	4.9	-



**Figure 1.** Contraction percent according to days

Z=Percent of contraction according to the day of report

## Conclusion

The process of contraction continues through 72 hours and may even after that. Main contraction occurs after 24 hours which is about 27% which reaches to 33% after 48 hours and 38% after 72 h, meaning after 24 hours immersion in 10% buffered formalin (fixative), the esophagus undergoes 27% contraction of its length, adding 6% after 48 h and another 5% after 72 hours. So, we recommend that contractility effect be under more consideration in the pathologist's report.

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## Conflict of Interest

The authors have no conflict of interest in this article.

## Authors' Contribution

Jalaluddin Khoshnevis reviewed the literature and designed the study and did the operations. Afshin Moradi helped in literature review, suggested fixative formula and measured the margins aside from Gholizade. Eznollah Azargashb suggested the methodology and analyzed the outcome. Barmak Gholizade helped in literature review, handling of the samples; measurement of the margins. Mohammad Esmail Akbari reviewed the article ultimately. Mohammad Reza Sobhiyeh contributed in

designing the study and performing the operations.

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