

# Comparison of three methods for skin markings in conformal radiotherapy, temporary markers, and permanent Steritatt CIVCO® tattooing: Patients' comfort and radiographers' satisfaction

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**Abstract:** Skin marking is routinely performed at the time of simulation before radiotherapy treatment. Worldwide different methods are used to mark the isocenter; most commonly used are temporary marker pens, commercially available tattooing needles pre-filled with non toxic India ink (Steritatt CIVCO®) and henna. The aim of this study was to compare these three different methods in the terms of durability, repetition of marking session, any allergic reactions, patient comfort and radiographer satisfaction.

Sixty patients with early prostate cancer were selected who were due to undergo radiation for eight to nine weeks duration. At the time of simulation, the participants' skins were marked by one of the three methods: temporary marker pens, henna, and Steritatt CIVCO® needling. The patients were evaluated for the durability of markings, number of times the markings were repeated and allergic reactions.

The patients' comfort was assessed by using a scoring system: they were asked to assess the method of the marking used. A rating scale was used: 1 = happy with marking method, 2 = seeking an alternate option. The radiographers were asked to score one of the methods using a scale 1-3: 1 = better, 2 = comparable, 3 = worse.

Mean duration of the skin markings was four days (2-5), 18 days (10-27) and 40 days for temporary marker pens, henna, and Steritatt CIVCO® needling, respectively. Patients with henna and permanent markings were equally satisfied with the less number of repeated markings. However radiographers were unsatisfied with henna because of the prolonged drying period (mean = 15 minutes). No skin allergies were seen in any procedure.

Permanent markings remain the standard for a radiotherapy unit, patients and radiographers. Although patients were happy with the henna markings it is not recommended due to prolonged drying period and the need for repeated skin markings.

**Keywords:** Lawsone, simulation, isocenter

## Introduction

Skin marking is routinely employed prior to radiotherapy treatment at the time of simulation [1]. During a course of radiotherapy, skin markings play a key role in terms of the reproducibility of treatment set-up and accuracy of treatment delivery [2]. The protocols for skin markings vary according to different institutions' protocols. The skin markings are done either on isocenter of the radiation field or on field margins [3]. Three methods are used for the skin markings [4]. Two of these methods are noninvasive techniques using marker pens and henna. The third is an invasive technique that involves using needles or commercially available tattooing needles pre-filled with non-toxic ink (Steritatt CIVCO®) [5]. See Figure 1.

Although being painless temporary skin markings, using marker pens, have some potential disadvantages: patients are not allowed



Figure 1: (a) Temporary marker pens (b) henna (c) Steritatt CIVCO®



Figure 2: Permanent tattoo of size 1-2 mm for laser alignment.

to shower or wash especially in the summer season and the frequent repeated sessions of markings lead to patients' discomfort and radiographers' dissatisfaction [6]. Another method for temporary tattooing is henna (*Lawsonia inermis*), which is a natural product that is popular in the Indo-Pak (India and Pakistani) region as it is used as a skin colorant [7]. It is applied to the skin in a paste form. Henna contains a compound called Lawsone [1]. Whilst drying, Lawsone, an hennotannic acid that is a red-orange dye, binds with proteins of superficial skin layers and stains the skin for weeks [8]. Henna used for skin marking in patients undergoing radiotherapy has shown an increase in accuracy of treatment delivery and increase in the comfort of patients [9].

Permanent tattooing is the most popular method for skin markings worldwide [10]. In this method a non-toxic ink is injected in the epidermis of the skin using a disposable needle to make a 1-2mm permanent tattoo (Figure 2). Nowadays pre-filled needles, such as Steritatt CIVCO®, are available. Potential hazards are needle prick injury and tattoo allergy, although, the latter is very rare [3].

These three different methods of skin marking were compared in terms of durability, repetition of marking session, allergic reactions, patient comfort, and radiographer satisfaction.

## Materials and methods

Sixty patients with early prostate cancer were selected. They were all scheduled for a curative dose of 72Gy over 8 to 9 weeks duration. The participants were divided into three groups (n = 20 per group). After obtaining written informed consent, at the time of simulation, the participants' skins were marked by one of the three methods for each group, namely; temporary marker pens, henna, and Steritatt CIVCO® needling. The participants were evaluated for durability of markings, number of times the markings were repeated, and any skin allergic reactions. The participants' comfort was assessed by using a scoring system; they were asked to rate their response to the selected method on a scale 1-2: 1 = happy with marking method, 2 = seeking an alternate option. Radiographers were asked to score one of the method by rating on a scale 1-3, 1 was labelled better, 2 was comparable, and 3 was rated as inferior while compared to its counterpart.

Data analysis was performed using Statistical Package for Social Sciences - version 16.0 software. Binomial tests were applied to get value of significance.

## Results

The mean duration for skin markings was 4 days (2-5) for the temporary marker pens, 18 days (10-27) for henna, and 40 days for Steritatt CIVCO®. Repeated markings were highest for the group on whom temporary marker pens were used with a mean of 10 (8-24), followed

by the henna group with a mean of 2 (1-4). Permanent tattooing did not fade over the treatment sessions hence there was no need for repeated marking on the relevant group. No skin allergy was recorded for all three methods. No needle prick injuries were reported by the radiographers.

The participants in the henna and permanent markings groups respectively were equally satisfied. The radiographers were not satisfied with the henna markings because of a prolonged mean drying time of 15 minutes (12-30 minutes), nor were they satisfied with the temporary markers because these resulted in an increased workload due to need for repeated remarking.

## Discussion

Skin tattooing for isocenter marking is an important tool in treatment set-up and delivery. Once the isocenter is marked then during treatment it is localized by either aligning lateral localization lasers to tattoo marks or by setting a constant daily couch-to-isocenter distance. For temporary skin marking marker pens or henna are used. For permanent tattooing Steritatt CIVCO® is used. In this study it was found that there were advantages and disadvantages for all three methods.

### Advantages and disadvantages of the three methods

#### (a) Temporary marker pens

##### Advantages

- An easy, painless procedure.
- A cost-effective method.

##### Disadvantages

- Washings and bathing not allowed which causes patient discomfort especially in hot weather.
- Frequent repetitions of markings add to radiographers' workload thus they feel dissatisfied as was noted in this study.
- Repeated markings may prolong the treatment time.

#### (b) Henna

##### Advantages

- It is more durable and requires a less number of repetitions during treatment course thereby increasing patient comfort.
- Washing and showering are allowed during the treatment course.

##### Disadvantages

- Prolonged drying period of henna keeps the simulator room and attending radiographers busy unnecessarily.
- It is not a suitable method for skin markings in centres with increased work loads.
- The addition of some agents to enhance staining of henna may impose allergic reactions [5]. Although no skin allergies were noted in this study the potential risk of skin allergy should be considered before utilizing henna for skin marking.

#### (c) Steritatt CIVCO® permanent tattoos

##### Advantages

- It is a permanent marking method with a small spot of 1-2 mm in size.
- There is no need for re-markings; patients' comfort and radiographers' satisfaction are enhanced.
- Showering and bathing are allowed during treatment.

##### Disadvantages

- Mild to moderately painful.
- Potential hazard for needle prick injury to radiographers [11].

- Possible tattoo allergy, but small data to support [12].
- Not cost effective [13].
- For female patients it may impose a cosmetic problem especially during breast radiotherapy [14]. However there is some literature that mentions tattoo removal by laser therapy [6].

There has been limited literature published regarding skin tattooing. Permanent tattooing was found to be more durable in this study. It increased patients' comfort levels and radiographers' satisfaction compared to other methods. However it is recommended that each institute should make its own protocol depending on workload and cost issues.

### Conclusion

Permanent marking method remains the standard for a radiotherapy unit. Patients were happy with henna markings as this method is not painful compared to permanent markings. However, due to a prolonged drying period and the need for repeated markings it is recommended that henna should not be used as a standard method especially in units with increased workloads.

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### Answers to the CPD questions of the April 2009 issue:

- |                 |                 |
|-----------------|-----------------|
| Question 1 (a)  | Question 11 (b) |
| Question 2 (c)  | Question 12 (a) |
| Question 3 (b)  | Question 13 (c) |
| Question 4 (a)  | Question 14 (d) |
| Question 5 (d)  | Question 15 (a) |
| Question 6 (d)  | Question 16 (c) |
| Question 7 (c)  | Question 17 (d) |
| Question 8 (b)  | Question 18 (d) |
| Question 9 (d)  | Question 19 (b) |
| Question 10 (d) | Question 20 (b) |