

# Modifications of Multi Slit Knife for Enhanced Versatility in Balding and Vertex Area Hair Transplant

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## Abstract

In hair transplantation, recipient-site creation is an important step. It is a repetitive and time-consuming step, which increased the “out-of-body time” for the grafts, which could hamper their survival. To solve this problem, we had devised an instrument called the Multi Slit Knife (MSK). The MSK has advantages of creating a high-density brick pattern of recipient sites in significantly less time. It had the undesirable side effect of damaging the preexisting hair follicles while making slits in the balding region. The MSK had some limitations. It was also difficult to maneuver the MSK in the vertex region where maintaining the natural whorl pattern of hair is important to obtain optimal aesthetic results. To overcome the shortcomings of the original MSK, we made a few changes to it to make a new modified MSK. It has fewer knives and a smaller platform as compared to the original MSK, better ergonomics, and more customizability with choices for blade sizes, number, and spacing. It tries to retain the advantages of the original MSK while reducing the damage to the preexisting hairs in the recipient regions. It is also better adapted at creating the recipient sites in a whorl pattern, closely mimicking the natural direction and angles of the hair in the vertex region. The modified MSK can be used singly or in combination with the original MSK, based on the patient’s recipient areas, making it a versatile set of instrument for making multiple coronal slits for hair transplant.

**Keywords:** Better graft survival, multiple coronal slits, reduction in surgeon’s time, thinning areas, transection rate

**Key message:** Easy to assemble, modified version of MSK is very useful in recipient-site slit creation in balding areas, with no/minimal damage to existing hair follicle, and vertex areas overcoming the shortfalls of MSK. It is very precise in terms of depth, direction, and angulations of recipient sites/slits. Customization is possible, with respect to recipient-site density, depth, and angulations. It is easy to calculate the total number of slits created. It saves surgeon’s time.

## INTRODUCTION

In the hair transplantation procedure, one of the key steps is creating recipient sites. The aim of hair transplantation is to produce a result that is undetectable, with the growth of transplanted hair mimicking the natural hair. Creating recipient sites takes up crucial time, impinging on the out-of-body time for the grafts. Moreover, creating recipient sites in areas of thinning is more complex and time-consuming. While performing so, not only does one need to avoid damaging the existing follicles but also maintain the direction, angle, and depth at the same time.

### Difficulties of existing techniques and review of prior art

Recipient-site creation is an important step in hair transplantation, and traditionally, it has been achieved

with many instruments such as hypodermic needles, chisel blades, and cut to size blades, typically taking 60–90 min for 3000 slits.

The aim was to make sure that the harvested grafts fit snugly in these sites, thereby ensuring optimal nutrition/oxygenation of grafts, and at the same time avoiding visible surface irregularities in the transplanted area.

Creating thousands of recipient sites is not only a repetitive and time-consuming task, but it also requires considerable

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focus on part of the surgeon to optimize the angulations, direction, and spacing of these sites.

Dr. Atodaria had already published their innovation about reducing the time in creating recipient sites (2014).<sup>[1]</sup> The innovative instrument is called “Multi Slit Knife” (MSK) [Figure 1]. The sole objective of devising MSK was to reduce the surgical time and effort for slit making/recipient-site creation, while maintaining precise slit placement. This instrument enabled the surgeon to create multiple slits in a single stroke, thereby significantly reducing the time taken to create these sites.

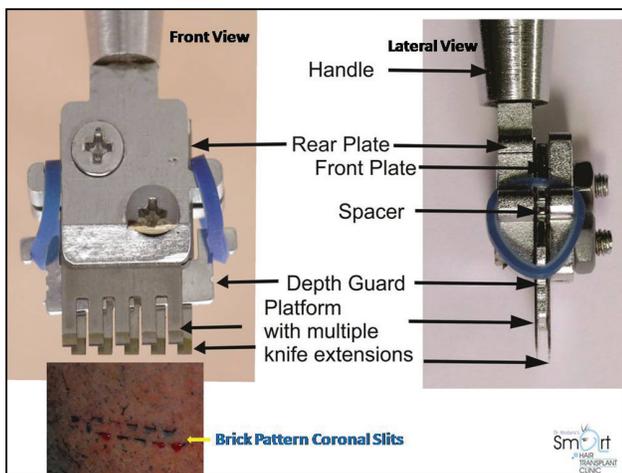
After regularly using the MSK, it was found to have some disadvantages when it came to creating slits in recipient areas with some preexisting native hair. As the spacing between the blades was fixed, it could not be adjusted to the variable spacing of existing hairs, and this led to some element of transection of the existing hair follicles. Also, it was difficult to change the direction of the slits in vertex area.

**Objectives**

To overcome these drawbacks, we wanted to devise a modified MSK that could reduce the transections of preexisting hairs in the areas of thinning and also make it more adaptable when creating recipient sites in the vertex area. We wanted to retain the advantages of the original MSK, which reduced the surgeon’s time of slit making, thus decreasing the “out-of-body time” for grafts, allowing early implantation, and improving graft survival.

To achieve these objectives, the following changes were made:

1. Smaller platform with two, three, and four knife extensions
2. Ergonomic handle to hold them

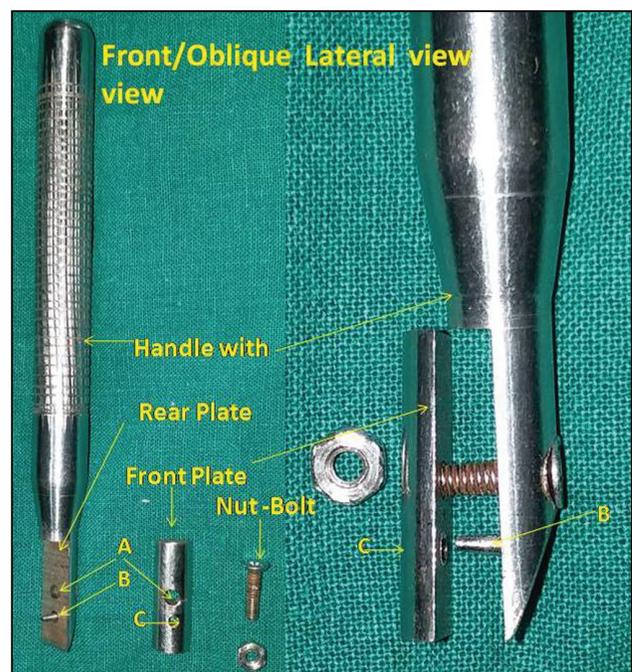


**Figure 1:** Original MSK instrument showing front and lateral views, brick pattern slits

**DESCRIPTION OF INSTRUMENT**

The instrument consists of the following:

1. A “platform” with preset multiple knife extensions: As shown in Figure 2, this has preset, identical or nonidentical, rectangular or conical multiple knife extensions with a chiseled edge. The platform can be easily attached by aligning holes on its surface with a bolt on the rear plate of the handle. Blades are separate and are disposable. They are sharp enough to last for one mega-session (up to 3000 slits if done at one go). The size of knife extensions range from 0.7 to 1.5 mm, which can be chosen based on the surgeon’s preference. The blades are manufactured separately.
2. Spacers: “Spacers” of thickness varying from 0.7 to 1.2mm, can be placed between two platforms with knife extensions. Spacers have an oblong hole on its surface for adjusting its lower border position, which acts as a depth guard to adjust depth of slits. These enable varying the density of the sites from 20 to 70/cm<sup>2</sup> [Figure 3].
3. Handle with rear plate: Handle is a long circular, rectangular or conical, solid or hollow rod having a rear plate at lower end, with a circular hole (A in Figure 2), and a cylindrical/conical extension (B in Figure 2) below the hole in midline axis. The hole allows for passage of bolt to attach the spacers, the platforms with knife extensions, and the front plate to the handle. The cylindrical/conical extension helps maintain the position of the platforms.
4. Front plate: It is identical to the rear plate in shape, and it has a similar hole for the bolt and a hole (C in Figure 2) to accommodate the cylindrical/conical extension (B in Figure 3).
5. Nut + bolts.



**Figure 2:** Platform with two knife extensions

### Cleaning and sterilization

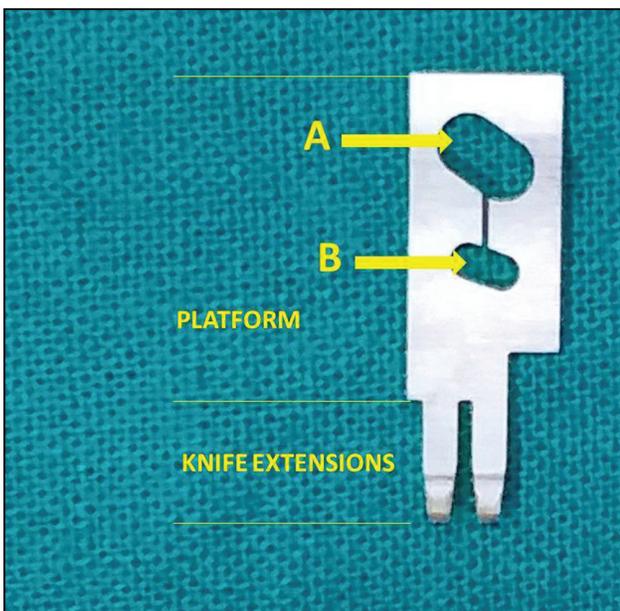
The instrument is autoclavable. The platforms with knife extensions can be sterilized by Ethylene Oxide Gas sterilization (ETO) or gamma radiation. At present, we are performing it by ETO.

### Advantages

The new modified MSK is easy to assemble. It is better adapted for recipient-site slit creation in the vertex area and balding areas with preexisting hair areas as compared to the previous version of the MSK. It is equally precise in terms of depth, direction, and angulations of recipient sites/slits. It is more customizable with respect to recipient-site density, depth, and angulations. It is easy to calculate the total number of slits created. It still retains the advantage of the original MSK, which reduced the time needed for recipient-site slit creation.

### CLINICAL PHOTOGRAPHS

Entire instance is shown in Figures 4–7. With respect to this particular case, in this patient, area A contains almost no existing hair follicles [Figure 4]. Areas B and C have several preexisting hair follicles, which need to be preserved. In bald area A, the original MSK was used, whereas in areas B and C, the modified MSK with a smaller platform and fewer knife extensions was used to minimize damage to the existing hair follicles, which is evident on magnification as shown in Figure 6. Although Figure 7 reveals the effectiveness in slit making in the vertex region, the modified version of MSK is depicted in Figure 8.



**Figure 3:** Front/oblique and lateral view of modified version of MSK with different components (Figure 3 A is a hole for accommodation of bolt while B is for accommodation of cylindrical/conical extension B in figure 2)

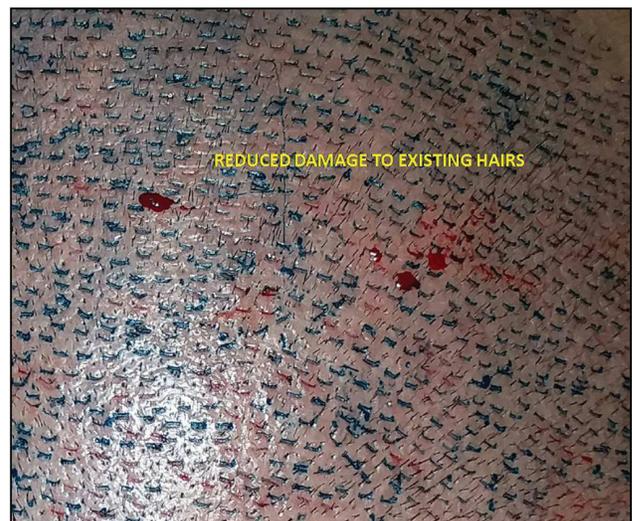


**Figure 4:** Clinical photograph showing area A without existing hair follicles (original MSK is indicated for slit creation), and areas B and C (modified version of MSK is indicated for slit creation)

### OUTCOME OF VERSION 1 & 2



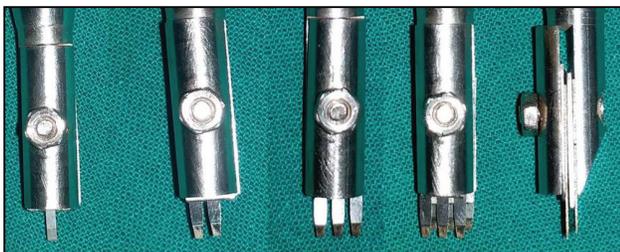
**Figure 5:** After creation of recipient-site slits—no/minimum damage to existing hair follicles in areas B and C



**Figure 6:** Enlarged view showing reduced damage to existing hair follicles



**Figure 7:** Slit making in vertex area—one or two knife extensions platform in the center of whorl and two or three knife extensions platform in periphery



**This modified version is used in the same way like original MSK**

**Figure 8:** Single platform is used in balding areas, whereas two or more platforms can be used in bald areas without existing hair follicles

## SUMMARY

After using the MSK in over 1000 patients over a span of 8 years, we realized that the MSK damages the preexisting hair follicles in balding areas. It was difficult to maneuver the MSK in the vertex region, where it is important to mimic the natural hair direction and angulations to obtain optimal aesthetic results. To overcome these difficulties, the MSK was modified while still retaining the existing instrument principle. The advantage of the modification is increased adaptability while working in areas of thinning. The modified MSK can be used as a single platform with two, three, or four knife extensions depending on the number of existing hairs in balding area. It causes less damage to the preexisting hair compared to the original MSK. The MSK modification with a smaller platform and one or two knife extensions is better adapted at recipient-site creation at the center of the whorl pattern in the vertex region, and the platform with two or three knife extensions is better suited for recipient-site creation at the periphery of whorl pattern, thus helping maintain the

natural hair direction and angle in the region [Figure 8]. These smaller blades can also be arranged in two or three rows, just like the original MSK, for making recipient sites in bald areas without any preexisting hairs.

The newer, modified MSK can be used singly or in combination with the original MSK to obtain optimal results. We found the modified MSK to be very useful in maintaining the direction, depth, and angle of slits [Figure 6], while still retaining the advantage of the original MSK, which drastically reduces the time needed for recipient-slit creation.

## Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

## Financial support and sponsorship

Nil.

## Conflicts of interest

The author (Pradipkumar R. Atodaria) has a patent pending on this device.

## REFERENCES

1. Atodaria PR. An innovative instrument for reducing surgeon's time in making recipient sites. *ISHRS Forum* 2014;24:131-2.