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Keratome, a Better Alternative Scalpel to No. 15 Blade for Finer Incision—Randomized Control Trial

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Abstract

Background Scalpel is the most common and oldest instrument used by surgeons for incision and to perform the surgery. A lot of improvement has occurred in the design of scalpel from the flint knife to the modern Bard-Parker handle with blades. The quest for improvement and finding a better instrument is neverending. In this study, we present an alternative scalpel to the no. 15 blade most commonly used by plastic surgeons.

Material and Methods Consultants and residents in plastic surgery department used a no.15 blade and a 15-degree straight keratome on randomly selected patients and used subjective numerical rating scale to assess the ease of incision and dissection. The data were collected and statistically analyzed.

Results In this study, 89 patients were included out of which 68 cases were operated by the consultants and 21 cases were operated by residents. The average score of ease of incision using a no. 15 blade by the consultants was 6.52 and by the residents was 6.125. The average score of ease of incision using a 15-degree straight keratome by the consultants was 8.74 and by the residents was 8.84. *p*-Value was statistically significant when no. 15 blades and 15-degree straight keratome were compared.

Conclusion 15-degree straight keratome is an excellent scalpel that can be used in preference to no. 15 blade as it is difficult to use.

Keywords
- scalpel
- no. 15 blade
- 15-degree straight keratome
- incision
- dissection

Introduction

The surgical incision is the basis of all surgical procedures, and the instrument used for incision is a surgical blade. There are many different varieties of blades available like no. 10, 11, 12, 15, 18, 19, 20, and many more (as shown in ►**Fig. 1**). Surgeons pick and use blades as per the requirement, the choice of the surgeon, and what they feel comfortable with. In general, no. 15 blade (blade with a small belly) (►**Fig. 2**) with a round handle is used by plastic and reconstructive surgeons. In many surgeries, surgeons have felt that the no. 15 blade is large for the procedure they perform and the vision of the incision is obliterated with the blade itself. As plastic surgeons, we have also faced the same problem with

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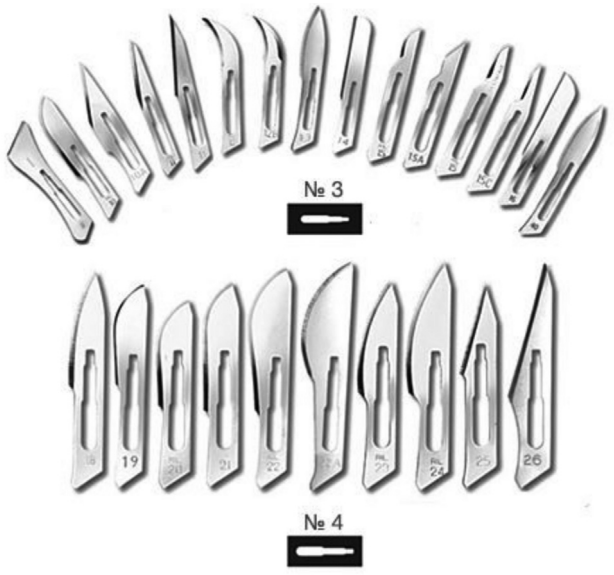

Fig. 1 Surgical blades.

Fig. 2 No. 15 blade.

no. 15 blade in few surgeries where a finer and smaller blade was needed so we started looking for an alternative and we found a blade perfect for our use in surgeries where we need fine incision and dissection. Our quest ended in the form of a keratome blade used by ophthalmologists for incision in the cornea. It is a very small blade and with a very fine and sharp edge. There are different kinds of keratome blades available like 15-degree straight and curved keratome blades. We as plastic surgeons started using keratome in surgeries where very fine incisions were required like scar revision. We found that it is very convenient to incise with keratome as it does not obliterate our vision, and it is lightweight, stable, and very sharp. We used it on few cases and started to study the ease of incision using keratome. There is no study where no. 15 blade is compared with keratome. We created a scale for assessing the ease of incision ranging from 1 to 10, with 1 being difficult incision and 10 being the easiest incision.

There is always a quest to improve surgical instrumentation for the ease of surgery. Here, we present our study to improve surgical instrumentation for finer incisions.

Material and Method

The Scale for the Ease of Incision

This scale was created before the study was started, to gauge the ease of incision. It is a subjective scale where a surgeon uses points ranging from 1 to 10 for the ease of incision, with 1 being the most difficult and 10 being the easiest. As there is no defined method to assess the ease of incision, a subjective numerical rating scale (SNRS) was created as used for assessing pain. Similarly, the ease of dissection (where dissection was done using a scalpel) was also assessed on a similar scale ranging from 1 to 10, with 1 being the most difficult and 10 being the easiest (►**Table 1**).

Methods

All adult patients (more than 18 years), for minor surgeries, presented to the Department of Reconstructive Surgery at INHS Asvini from February 2018 to March 2021 were included in this study. Patients were randomly selected for the kind of scalpel to be used for surgery using the sealed envelope method. Patients were explained about the study and informed consent was obtained. Patients that were subjected to the surgery using the kind of scalpel were selected using random method selection. The ease of incision, dissection, blood loss, ease of closure, quality of the scar, and any

Table 1 Subjective numerical rating scale

Subjective numerical rating scale									
Ease of incision									
1	2	3	4	5	6	7	8	9	10
Most difficult									Easiest
Ease of dissection									
1	2	3	4	5	6	7	8	9	10
Most difficult									Easiest
Ease of closure									
1	2	3	4	5	6	7	8	9	10
Most difficult									Easiest

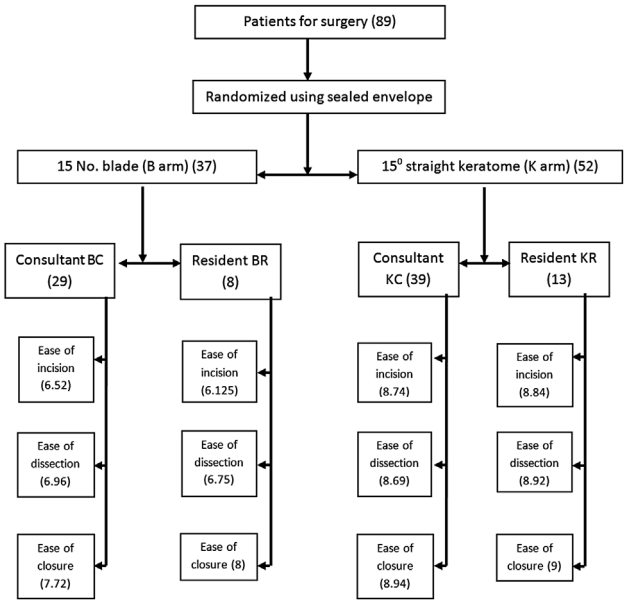

Fig. 3 Methodology of the study.

postoperative morbidity were assessed. Initially, the surgeries were performed by the consultants when the consultants were confident about the use of keratome and the scope of the study was extended to surgery residents to reduce the personal bias of the surgeons. All the surgeries conducted by residents were performed under the direct supervision of the consultant. Data were collected and analyzed. Data collected were subjected to statistical analysis and compared.

Patients selected for surgery were randomized into no. 15 blade arm (called B-arm) and 15-degree straight keratome arm (called K-arm). Each arm was further divided into the consultant and the resident arms. Each arm, B-arm and K-arm, was compared with the corresponding arm in the consultant and resident group to reduce the personal bias.

The author maintained meticulous data after each surgery, and points given about the ease of incision, dissection, closure, and blood loss, postoperative recovery, morbidity, and quality of the scar were recorded. Surgery residents were also asked to fill the proforma after each surgery. Data were collected for 3 years. Statistical analysis was performed using XL stat software using a two-tailed student *t*-test using an unequal variance. The methodology of the study is depicted in ►**Fig. 3**.

The clearance of the institutional (INHS Asvini) ethical committee was obtained to conduct this study as a new instrument was being used.

Results

In this study, total of 89 patients were recruited, and they were randomly allotted B-arm or K-arm using the sealed envelope method. Out of these 89 patients, 37 patients were selected for B-arm and 52 for K-arm. The discrepancy in the number of patients in each arm is purely by chance. Age ranged from 18 years to 61 years. All patients were operated upon for surgery under either general anesthesia (GA) or local anesthesia (LA) depending upon the case. The selection of anesthesia depended on the kind of surgery, patient's choice, and condition of the patient. Most of the surgeries were performed under LA using 2% lignocaine with 1 in 100,000 adrenaline + 0.5% bupivacaine. Very few cases were done under GA, where the patient was not willing for LA or the condition of the patient was not suitable for LA.

In B-arm, 29 patients were operated on by a consultant called B-consultant (BC) arm and eight patients were operated on by residents called B-resident (BR) arm. In BC arm, the average score of the ease of incision was 6.51 (5–8), ease of dissection was 6.96 (6–8), and ease of closure was 7.72 (6–9). In BR arm, the average score of the ease of incision was 6.12 (5–7), ease of dissection was 6.75 (5–9), and ease of closure was 8 (7–9) (►**Fig. 3**).

In BC and BR arms, the statistically null hypothesis stated that both the consultant and the resident will have the same level of difficulty. The BC and BR arm was compared for the ease of incision, dissection, and closure by using the student *t*-test for two tails with an unequal number of entries. The *p*-value for the ease of incision was 0.40, for the ease of dissection was 1.00, and for the ease of closure was 0.34. This suggests that the null hypothesis is true and both arm BC and BR are comparable which means that consultant and resident had the same level of difficulty using no. 15 blade (►**Table 2**).

In K-arm, total of 52 patients were included and out of which 39 were operated on by a consultant (called KC arm) and 13 patients were operated on by a resident (called KR arm). In KC arm, the average score of the ease of incision was 8.74 (7–9), ease of dissection was 8.69 (6–9), and ease of closure was 8.94 (8–9). In KR arm, the average score of ease of incision was 8.84(8–9), ease of dissection was 8.92 (8–9), and ease of closure was 9 (9)(►**Fig. 3**).

In KC and KR arms, the statistically null hypothesis stated that both consultant and resident will have the same level of difficulty. The KC and KR arms were compared for the ease of incision, dissection, and closure by using the student *t*-test for two tails with an unequal number of entries. The *p*-value

Table 2 Comparisons of *p*-value of BR with BC arm and KR with KC arm

	BC arm avg score	*p*-Value	BR arm avg score	KC arm avg score	*p*-Value	KR arm avg score
Ease of incision	6.52	0.40	6.125	8.74	0.54	8.84
Ease of dissection	6.96	1.0	6.75	8.69	0.29	8.92
Ease of closure	7.72	0.34	8	8.94	0.42	9.0

Abbreviations: avg, average; BC, B-consultant; BR, B-resident; KC, K-consultant; KR, K-resident.
Note: *p*-Value comparisons of BR with BC arm and KR with KC arm.

Table 3 Comparisons of *p*-value of BC with KC arm and BR with KR arm

	BC arm avg score	*p*-Value	KC arm avg score	BR arm avg score	*p*-Value	KR arm avg score
Ease of incision	6.52	<0.0001	8.74	6.125	<0.0001	8.84
Ease of dissection	6.96	<0.0001	8.69	6.75	<0.0001	8.92
Ease of closure	7.72	<0.0001	8.94	8.0	0.01	9.0

Abbreviations: avg, average; BC, B-consultant; BR, B-resident; KC, K-consultant; KR, K-resident.
Note: *p*-Value comparisons of BC with KC arm and BR with KR arm.

for the ease of incision was 0.54, for the ease of dissection was 0.29, and for the ease of closure was 0.42. This suggests that the null hypothesis is true, and both KC and KR arms are comparable which means that consultant and resident had the same level of difficulty using 15-degree straight keratome (►**Table 2**).

On comparing BC and KC arms, the *p*-value was <0.0001 for the ease of incision, dissection, and closure. The *p*-value for all three parameters was significant. The null hypothesis states that the consultant will have the same level of ease while using no. 15 blade and 15-degree straight keratome, which was disproved by the study. This means that KC and BC arms are not comparable and statistically significant. This shows that it is easier to use a 15-degree straight keratome than a no. 15 blade (►**Table 3**).

To avoid the personal bias of consultant BR and KR arms were also compared. The *p*-value for the ease of incision and dissection was <0.0001 and closure was <0.001 which was statistically significant. The null hypothesis that the residents will have the same level of ease while using no. 15 blade and 15-degree straight keratome is not true. This means that it is easier to use a 15-degree straight keratome than a no. 15 blade even by the residents (►**Table 3**).

In this study, the surgeries performed in both the arms include scar revision using geometric broken line closure (GBLC), sebaceous cyst excision, excision of nevus, lipoma excision, Atasoy flap for fingertip injuries, blepharoplasty, subungual glomus tumor excision, soft tissue tumor fingers, sinus excision, basal cell carcinomas excision and flap cover, dermoid excision, arteriovenous malformation excision, papilloma, and wart excision. The kind of surgeries in both arms was similar.

Blood loss in both arms was minimal with no postoperative morbidity. The blood loss and postoperative morbidity were comparable. Blood loss and postoperative morbidity were points of evaluation at the beginning of the study, but it was comparable in both the arms. The scars formed in both the arms were comparable (good to excellent). The scars formed in both the arms were similar with no difference in appearance. No scale of assessment of scar was used but clinically the scars were similar.

Discussion

Scalpel is the basic instrument used by surgeons for incision and dissection. The quality of the incision decides the quality of surgery and the scar. The kind of incision is depended on the kind of scalpel used. Plastic surgeons are known to introduce a very fine incision. There are different kinds of scalpels and blades described for surgical use (►**Fig. 1**) ranging from no. 10 to no. 22. Most of the surgeons used no. 15 blades for a fine incision (►**Fig. 2**). No. 10 blade is also sometimes used for the same kind of incision. Few surgeons use no. 11 blades for fine incision and dissection.

When the authors were using the no. 15 blades for the GBLC technique for scar revision, they found that the blade was fairly big for very small incisions and raising very small flaps. The authors started a quest to look for an alternative scalpel. They came across a blade 15 A (►**Fig. 2**) which is not easily available. Using blade 15 A on few cases, the problem of blade no. 15 did not seem to be solved, as the size of the blade is the same, but dissection of tissues and raising of the flap were quite easy with blade 15 A. The authors kept on looking for some alternative to the usual blade.

The quest of the authors ended in the form of keratome which is available in different shapes (►**Fig. 4**). Comparing the size of no. 15 blade, 11 no. blade, and 15-degree straight keratome, it is observed that the size of the keratome is very small (►**Fig. 5**). Keratome is the knife used by an ophthalmologist for incision on the cornea for intraocular surgeries. The author tried a 15-degree straight keratome for scar revision using GBLC. During the initial case, it was found to be a very effective instrument for fine incision and fine dissection for raising very small flaps. On trying the knife on a few cases, the authors were satisfied and considered that it was a good instrument for use in surgeries that need very fine incision and dissection.

The authors decided to conduct a study for assessing the ease of incision using the keratome. Searching any published article for the same on the internet provided no results. Only

Fig. 4 15-degree straight keratome.

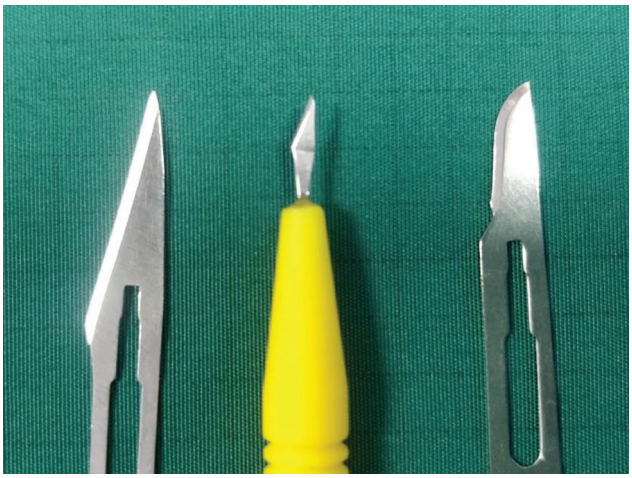

Fig. 5 Comparison of scalpels.

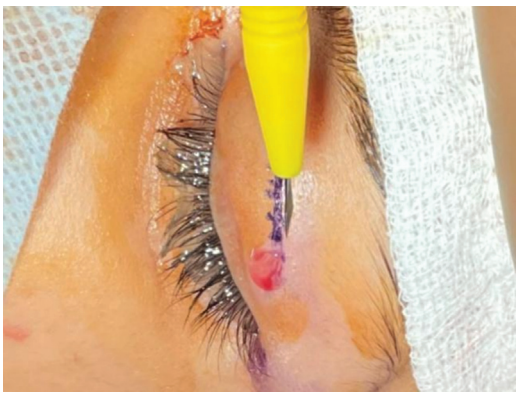

Fig. 6 Keratome being used for upper eyelid incision.

one letter to the editor in the *Journal of Clinical Orthopaedics and Trauma* for the use of keratome 1-0 for percutaneous tendo Achilles tenotomy for the correction of equinus deformity in club foot was found.[1] So, to assess the ease of incision, dissection, and closure of incision an SNRS was created. The scale was first assessed by the authors on few cases and when they were satisfied, it was used in this study.

In this study, patients reporting to the department of reconstructive surgery for minor surgery were randomized for no. 15 blade (B-arm) and keratome (K-arm) using the sealed envelope method. During surgery, the surgeons gave numerical scores for the ease of incision and dissection using the scalpel and also for the closure of the incision. Once the authors were satisfied with the outcome of keratome, the scope of the study was extended to the residents in general surgery. The residents were asked to use the knife or keratome and give a numerical score for the ease of incision, dissection, and closure.

On comparing the blade arm and keratome arm, the *p*-value was found to be statistically significant. On comparing resident and consultant arms, the *p*-value was not significant. It proves that it is easier to use a 15-degree straight keratome than a no. 15 blade for a fine incision.

The no. 15 blade was fairly big for incision in conditions where a very small incision is required like scar revision, glomus tumor, blepharoplasty, a columellar incision in rhinoplasty, ear lobe repairs, sebaceous cyst excision, nevus excision over nose, forehead, and cheek, and gold weight insertion in upper eyelid for Bell's palsy (►**Fig. 6**). As the size of the blade is big, it obscures the vision of the surgeon and sometimes it slips and can result in an uneven incision. Even the dissection with a scalpel is very easy, as it is very sharp and pointed. It is also very helpful in incising fibrotic tissue in contracture. During the closure of the incision, it was felt that due to fine incision the suturing was also easy as the margins were not uneven. It is very light in weight and grip is also very good and does not slip. As its size is small, it is very helpful to use with magnification like Loupe. The authors have used it with magnification ranging from 2.5× to 4.0× and found it to be very helpful.

The problem with the keratome is that it is designed to be used for very delicate tissue like cornea and when it is used for tough tissues like fibrosis or scar it becomes blunt after a few incisions, so one may require more than one keratome in one surgery depending on the size of incision and the kind of tissue.

Conclusion

We conclude that a 15-degree straight keratome is a better scalpel than a no. 15 blade and can be used as an alternative. It is also easier to handle and to be used with magnification. However, this study has many flaws like the number of cases is less, it is not a blinded study, and it is very difficult to assess as it is a very subjective feeling but this is the first study of its kind and further studies will clear the picture.

Conflict of Interest
None declared.

Reference

1 Goyal S, Sangwan SS, Gogna P, Singla R, Kundu ZS. Use of keratome 1-0 for percutaneous tendo Achilles tenotomy for correction of equinus deformity in club foot. J Clin Orthop Trauma 2014;5(02): 115–116

