INTRODUCTION
Since the introduction in 1918 by Esser\(^1\) of the concept of coupled flaps to cover simultaneously a round skin loss along with the donor site and then its modification by Zitelli,\(^2\) many techniques have been devised and are based on optimizing the arc of rotation of the flap to prevent the distortion of tissue that the movement might entail.\(^3,4\) Most of these techniques are aimed at defects of the face. Each variation on this theme has in common to get an even redistribution of the adjacent tissue of the skin gap.\(^5\)

Gradually, in particular cases, the original design of coupled, juxtaposed flaps such as the “bilobed, trilobed flaps” of Esser-Zitelli has shifted to the concept of opposing skin flaps.\(^6\) Actually, the former has flaps originating both from one pole of the tissue gap while the latter borrows tissue from two different sides of the circular skin defect.

Indeed, the rationale of flaps from opposing poles finds their justification in less distortion of the adjacent tissue and a better redistribution of it.\(^7\) The procedure is staged by splitting in two halves the amount of tissue required to fill in a gap, then after recruiting these two halves from the opposing poles of the circular skin defect, making them converge to the center of it.\(^8\)

The study we now present introduces the modification of this well-known technique, which relies upon convex flaps in a setting as peculiar as a circular gap; it is represented by the transposition of triangular opposing skin flaps, randomly recruited on the boundary of the defect. They just need to abide by the rule to arise from the opposing poles of the circumference. Furthermore, the versatility of this new approach is tested in different anatomic districts.

MATERIALS AND METHODS
The study has examined the period from June 2017 to January 2018. Data from the enrolled patients have been retrospectively collected. The procedure has been approved by and carried out according to the guidelines of the Trust Ethical Committee of the hospital; each patient has signed a detailed consent form.

The inclusion criteria have been any subject needing a resection for primary skin lesions or reoperation needing an enlargement to a circular healthy tissue; the area to reconstruct has had, however, a diameter of up to 5 cm.

Exclusion criteria have been as follows: subjects with systemic skin disorders such as lymphoproliferative diseases or connective diseases.

Patients and a panel of two plastic surgeons have judged the final outcome, the latter on the basis of photographs.
everyone scoring the results according to a Likert item qualitative evaluation scale (Table 1).

Although the small sample size, a few data for a descriptive analysis have been collected: age (years range, ± SD), sex, comorbidities, pathology of the skin lesion, dimension of the skin excision, complications such as dehiscence of the wound and necrosis of the flaps.

Operative Technique

We have chosen to apply these criteria for circular lesions with a diameter of up to 5 cm. The technique could be summed up as the coupling of two opposing, specular “Z plasties” whose arms are transposed 60° to each other.

Actually, to recruit the healthy skin required to fill in the remaining gap, we have split the amount of tissue needed in two units of triangular shape in the adjacent area of the surgical defect.

Each triangle is designed with one of their long sides, the more proximal to the circumference, starting at the extremity of one of the defect diameter, chosen as principal and conventionally labeled “diameter 1”, where it intersects the circumference (Fig. 1).

The height of each triangle is at an angle of just 90° with the principal defect diameter or diameter 1; each apex of the triangular flaps should point to the opposite direction; as a consequence these twinned flaps have their apex spanning 180°.

The triangular flaps are isosceles in their shapes and the respective heights should be as long as the length of the defect radius. When incised, the triangular flaps are random for their vascularization and are both transposing and sliding flaps.

The first step of the reconstruction begins by sewing the apex of the triangle to the skin border of the defect where the secondary diameter of the circle, conventionally labeled diameter 2, intersects the circumference. The rule is that at each opposing pole of the circular skin defect, there is this mirroring, specular construct.

Second step, transposition of secondary or complementary angle of the asymmetric “Z”. This angle results from the long proximal side of the triangle where it meets the round skin gap. The apex of this secondary angle is sewn to the origin of the farthest side of the already moved skin triangle.

The result, after every geometric segment has been moved, there is an irregular, oblique “saw teeth edge,” about 10 cm long for a circumference whose diameter is 5 cm (Fig. 1); the orientation of the final scar depends on the origin of the opposing triangles and might easily be reckoned so as to make it lie parallel to the relaxed skin tension lines.

RESULTS

The retrospective search has shown a total of 6 cases, 2 women and 4 men of Caucasian origin who have been consecutively operated on; the age range has been 36–87 years, mean 65, SD ± 18.51, no one has shown major comorbidities such as diabetes, hypertension, heart disease, vascular disease, nor have they been active smokers.

Each patient but two has called for an enlargement of a previous surgery; the skin gap around the lesion or the

Table 1. Modified 5-level Likert Item Qualitative Evaluation Scale

| Score | Unfair | Fair | Neutral | Good | Excellent |
|-------|--------|------|---------|------|-----------|
| Patient |        |      |         |      |           |
| Scar unconsciousness | 1 | 2 | 3 | 4 | 5 |
| Camouflage |        |      |         |      |           |
| Surgeon 1 |        |      |         |      |           |
| Scar unconsciousness | 1 | 2 | 3 | 4 | 5 |
| Camouflage |        |      |         |      |           |
| Surgeon 2 |        |      |         |      |           |
| Scar unconsciousness | 1 | 2 | 3 | 4 | 5 |
| Camouflage |        |      |         |      |           |
| Total score |        |      |         |      |           |

It has been adopted to describe the patient and panel of surgeons subjective scoring of the surgery. The score is on the basis of 2 questions, scar unconsciousness and the camouflage effect of the jig-saw scar. Each participant has been given this form to fill in the appropriate section.

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Fig. 1. A, The model shows the round gap of 5 cm as diameter, and the triangular isosceles flaps arise from the opposite poles of the circle; their height is ½ the diameter. B, Sliding of the flaps in their new position turns out in a final design of an asymmetrical jig saw.
scar of a previous surgery has been always a circular defect of a diameter up to 5 cm.

The postoperative pathology of the lesions has been the following: one case of recurrent squamous cell carcinoma, one case of basal cell carcinoma, one case of melanoma; revision of a case of primary atypical histiocytoma, a clinical melanoma confirmed through a biopsy and one case of previously biopsied Bowen disease. This reconstruction for the lesions has been justified by the dimension of the primary lesion or the need to dissect healthy tissue to guarantee a thorough and safe excision.

The anatomical districts involved have been: thigh in 2 patients, arm in 1 patient, shoulder in 1 patient, face in 1 patient, and chest in 1 patient.

Every patient who has received this reconstruction has had an uneventful follow-up at 1 week, 5 weeks, and 3 months. Those complications usually seen in Z plasties such as dehiscence of the wound and necrosis of the flaps have not occurred. The patients included in the study have not required nor asked for any procedure aimed at modifying the surgical outcome.

Each patient has valued the final cosmesis of the ensuing scar as “good – excellent” based on two subjective

![Fig. 2. Triangular opposing skin flaps in a man 74 years old, recurrent squamous cell carcinoma of the face, resection of a safe round margin of about 5 cm as a diameter. A, Preoperative lesion and dimension. B, Postoperative result.](image)

![Fig. 3. Triangular opposing skin flaps in a man 85 years old, Bowen disease of the right shoulder, diameter of the lesion 5 cm. A, Preoperative skin lesion. B, Circular skin gap and incised triangular opposing skin flaps. C, Postoperative result.](image)
criteria, scar unconsciousness, and the camouflage effect of the jig-saw scar (Fig. 2).

The panel of surgeons have agreed on this qualitative scoring but for one patient with the thigh lesion. In this case, the Likert score given has been “undecided” for one surgeon (Fig. 3).

We have found that the final linear scar has been about 10 cm long for a round defect of a diameter of 5 cm (Fig. 4).

**DISCUSSION**

Circular skin lesions have always set a technical challenge to properly fill in the gap.

Several methods are reported to work the issues other than local flaps.

Skin grafts in their variants, full and split-thickness skin grafts, lack by definition the support of the subcutaneous tissue and though an easy- to go way to close any skin gap, are bound to a potential, less than optimal, cosmetic result.

Microsurgery-based flaps, seem to be too much time and resources consuming for resurfacing skin gaps up to 5 cm.

Random vascular local flaps for round skin defects have mainly relied upon the original idea of Zitelli later
modified and improved by Albertini and Hansen in the bilobed-trilobed transposition flaps. The complexity implied in the design and the angles among the coupled circular flaps to prevent a pincushioning might result in more than an issue for the surgery.

In 1998, Keser et al. described a technique based on two semicircular opposing flaps to deal with this issue; he maintained that this could be a way to optimize the recruitment of adjacent tissue without the need to sacrifice further healthy skin.

Nonetheless, because of the convexity of the flaps’ extremities, it seems unavoidable that there is a “dog ears” appearance; after the site they come from is closed, this usually prompts the Burow’s triangle excisions.

The technique we have applied indeed allows to empirically get a fixed ratio of 2:1 between the final linear scar and the diameter of a round skin gap; thus for a circular defect of a diameter up to 5 cm the resulting linear scar turns out to be up to 10 cm.

The easier advantage for the surgeon is to reckon in advance the length of the final scar and to identify an anatomic district more suited to bear such a linear final result.

Most notably, the number of individuals studied is too small to draw meaningful evidence; because of this, this article has just summarized a few demographic patients’ details without a full statistical elaboration.

It is a common observation that resecting and closing the redundant wedge tissue in a straight line extends the final scar.

Actually, it seems that the different techniques till now offered share this disadvantage and would just benefit from the beginning by the modification of the flap landmark. Switching from coupled convex flaps to coupled triangular flaps, as we propose, could do the trick.

The ideal aim of any reconstructive surgery should be to spare as much healthy tissue as possible and, all the same, procuring as little distortion to the area involved as possible.

Another important factor is the dimension of the skin gap to be replaced.

An acute border, contrary to the convex counterpart, represents a way to optimize the tissue borrowed around the lesion; a customized double “Z” plasty with asymmetrical arms where the longest one is turned 60° over the skin gap fits well this task; when carried out twice at each facing pole of the circular defect, it brings about a split of the gap in two and makes easier its closure.

Indeed, using wedge flaps, as this method suggests, allows to avoid from the beginning the so called “dog ears”, namely the tissue protrusions or pincushioning linked to the convex flaps.

Further advantages of this technique are sparing healthy tissue resected to compensate them and to prevent the consequent longer scar due to the correction of the Burow’s triangles.

We have found this design an effective method ubiquitous to apply and ready to use.

More related benefits to outline are the following: it prevents the isolation of perforators implied in those complex procedures such as the perforator flaps because it relies upon a random vascular pattern, it evenly redistributes the forces of the triangular flaps over each semicircle of the original skin gap; eventually, it provides an easy and predictable way for the scar to lie parallel to the relaxed skin tension lines.

**CONCLUSIONS**

This study has briefly described a novel technique based on the modification of the existing procedures aimed at correcting circular skin defects. It consists of coupling two opposing wedge flaps rotated in the round skin defect; the effects it entails are discussed.

Limits of the study turn out to be the small number of patients, its retrospective, not randomized nature, the limited range of anatomic districts, and a relative short patient’s follow-up.

We aim to further improve this technique with a more in-depth analysis on a wider dataset.

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