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# Vasomotor changes in abdominal skin after endoscopic subcutaneous/Preaponeurotic Repair of Diastasis Recti (REPA)

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## ABSTRACT

**INTRODUCTION:** Diastasis recti is a common condition with functional and cosmetic effects that can occur in both female and male patients. However, it is more prevalent in females after pregnancies and can be associated with midline hernias. The preaponeurotic endoscopic repair (REPA) has become an emerging procedure for the surgical treatment of this condition.

**CASES REPORT:** We present four cases of vasomotor changes in the abdominal skin, during physical activity or heat exposure, limited to the subcutaneous dissection area after REPA. All patients reported occasional skin redness (erythema) in the subcutaneous dissection area, triggered by exposure to heat or sunlight. The skin redness subsided completely in all the patients after a few minutes in a cool environment and after cessation of physical activity.

**DISCUSSION:** Recently, subcutaneous preaponeurotic repair of diastasis recti has gained popularity. Changes in abdominal skin sensitivity have been reported, but to the best of our knowledge, this is the first report of what appears to be vasomotor skin changes after these procedures.

**CONCLUSION:** Vasomotor changes can occur after endoscopic dissections of the abdominal skin and subcutaneous tissue. Incidence and causes remain unclear.

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## 1. Introduction

Endoscopic subcutaneous repairs of diastasis recti, associated or not to midline hernias, have recently become a common procedure. This kind of surgery has been given different names or acronyms but it essentially consists in an endoscopic separation of the skin and subcutaneous fat from the fascia using diathermy (monopolar energy with hook electrode), or sometimes an ultrasonic device or bipolar energy (Fig. 1), suture repair of the diastasis by plicating the rectus muscle sheath (Fig. 2), usually placing an onlay mesh and reinserting the navel by suturing it to both the fascia and the mesh. When there are midline hernias, they are closed separately, using absorbable barbed sutures, and/or the defect is incorporated in the plication of the fascia.

## 2. Case report

We report four cases of female patients, mean age 31.71 years (30–34), average BMI: 23 Kg/m<sup>2</sup> (21–24), three of them with two



Fig. 1. Intraoperative external view (abdominal skin trans-illumination).

previous pregnancies and the fourth patient with one. The fourth patient underwent preaponeurotic endoscopic repair (REPA) of diastasis recti, and umbilical hernia repair. Three of the patients were operated on in Rosario, Argentina and one in Barranquilla,

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Fig. 2. Endoscopic view: rectus sheath plication.

Table 1  
Demographics and patient characteristics.

Patient	AGE	BMI	DIASTASIS	U. HERNIA	P.P	NOTED	F U
1	33	22	5 cm	3.0 cm	2	120 days	6 M
2	30	24	5 cm	2.5 cm	1	120 days	6 M
3	34	21	4 cm	2.0 cm	2	90 days	6 M
4	30	24	4 cm	1.5 cm	2	90 days	6 M

BMI: Body Mass Index (Kg/m<sup>2</sup>). P.P: Previous pregnancies. F.U: Follow-Up (months).



Fig. 3. Transient erythema of the abdominal skin triggered by heat and limited to the subcutaneous dissection area.

Colombia by dedicated abdominal wall surgeons. The diastasis was 5 cm in width in two of the patients and 4 cm in the other two (M1-3, W2 in all patients according to the proposed German Hernia Society classification) [1]; all four patients had umbilical hernias with an average diameter of 2.25 cm (1.5–3 cm) (Table 1). All patients reported occasional skin redness (erythema) in the subcutaneous dissection area, triggered by exposure to heat or sunlight for over 20 min (Fig. 3), or during physical activity in one case (usually shortly after starting her workout at the gym). The phenomenon was noted after 90 days in 50% of the patients and after 120 days in the remaining 50%. The skin redness subsided completely after a few minutes in a cool environment and after cessation of physical activity in all the patients. Three patients reported some skin edema during the episodes which subsided completely as well. All four patients had hypoesthesia of the abdominal skin, mainly periumbilical and sub-umbilical (zones 5 and 8 in the proposed topography for sensitivity changes after abdominoplasty) [2–4]. None of the patients were concerned with the phenomenon and all of them reported a high level of satisfaction with the results of the procedure. After six months of follow-up, the episodes were still present with some amelioration.

All patients gave their consent for the publication, and for using images, with no exposure of personal data.

This report was registered under the UIN 5888 in the Research Registry Database [www.researchregistry.com](http://www.researchregistry.com) and has been pre-

pared in accordance with the Surgical Case Reports Guidelines (SCARE) [5].

### 3. Discussion

In recent years, a “new” procedure for the treatment of diastasis recti, associated or not to midline hernias, has become popular in many countries. Before the description of preaponeurotic endoscopic repair of diastasis recti (REPA) by Derlin Juarez Muas [6], the approach to this condition usually consisted in an “open” surgery, frequently combining the plication of the anterior fascia with an abdominoplasty. Other open, hybrid or endoscopic procedures have been used to treat this condition [6–13] but, due to the low cost, the avoidance of an expensive mesh with anti-adhesive barriers, its technical simplicity, the need for few ports and other advantages of REPA, it has gained popularity. Among the reported complications or adverse effects are seroma, skin burns, umbilicus site infection and some other side effects such as numbness or paresthetic sensations in the abdominal skin [6,9]. Most of these complications or side effects are very similar to those seen for decades after abdominoplasties and/or liposuctions [3]. Aherrera et al. reported that up to 56.7% of patients subjectively reported the presence of an abdominal cutaneous sensibility change post-operatively. However, most of them (82.4%) showed indifference towards this outcome after abdominoplasties [4].

In general, skin blood flow in humans increases markedly in response to heat stress and physical activity. These changes in the skin blood flow and in the diameter of the blood vessels are part of the normal thermoregulation in humans. Vasodilation and increased skin blood flow (along with sweating) are an important part of the mechanisms that lead to the necessary heat dissipation during increases in environmental temperature and/or exercise. The central control of thermoregulation is located in the brain’s preoptic/anterior hypothalamus. Information on core and surface (skin) temperatures is transmitted to the preoptic anterior hypothalamus which generates the efferent response. During exercise or exposure to heat, increases in body temperature trigger vasodilation and skin sweating [14,15], substantially increasing convective heat transfer from the core to the periphery (skin), and from it to the environment, thus contributing to the mechanism of thermoregulation. Two populations of sympathetic nerves control skin circulation: the sympathetic adrenergic vasoconstrictor nerves and the sympathetic vasodilator nerves; the latter is activated during hyperthermia. The sympathetic vasoconstrictor and vasodilator nerves innervate all areas of non-glabrous skin (including the abdominal wall skin), while areas of glabrous skin (lips, palms, soles of the feet) are only innervated by the sympathetic vasoconstrictor nerves. Another important difference between glabrous and non-glabrous skin is the existence of arteriovenous anastomoses which are low resistance connections that allow high flows from arterioles to venules. In glabrous skin, arteriovenous connections are numerous, and it is innervated by the sympathetic vasoconstrictor nerves. Therefore, in these areas, the opening or closing of these connections can cause substantial changes in the skin blood flow. In contrast, non-glabrous skin, like that of the abdominal wall, has few arteriovenous communications and it is innervated by the sympathetic vasoconstrictor and vasodilator nerves [14].

Skin vasomotor changes after REPA can be related to the interruption of nervous and vascular tracts (mainly perforator vessels), but the mechanism responsible for this phenomenon is unknown. This interruption can cause an alteration in the normal regulatory changes of the skin vessels due to heat, thermal stress and exercise, making this response “autonomous” and different from the “normal” regulatory vasomotor reflexes in the skin outside the subcutaneous dissection boundaries.

#### 4. Conclusion

Vasomotor changes can occur after endoscopic dissections of the abdominal skin and subcutaneous tissue, as those performed during endoscopic subcutaneous/preaponeurotic repair of diastasis recti (REPA). The incidence of this phenomenon is unknown and probably underreported and underestimated. The clinical relevance is unknown and it is probably low, but further studies are needed to determine the real occurrence rate and clinical relevance of these changes. As far as we know, this is the first report on these vasomotor events after endoscopic subcutaneous dissections. This report would raise awareness among abdominal wall surgeons who perform this kind of procedures to report the occurrence of this phenomenon, and to inform patients about the possibility of the appearance thereof.

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#### Declaration of Competing Interest

The authors, have no financial, personal or business relationships, with individuals or organizations that could inappropriately influence this work.

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#### Ethical approval

The ethics committees of the institutions involved (Clinica Portoazul and Hospital Italiano), exempted this manuscript from requiring approval, because it does not reveal sensitive data of personal or medical information, and it limited itself to reporting the occurrence of a postoperative phenomenon after an approved surgical procedure

#### Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

#### Author contribution

Andres Hanssen MD, FACS (Case contribution, writing). **Corresponding author.**

Ezequiel M. Palmisano MD (Case contribution, data collection)  
Diego A. Hanssen MD. (Data Collection, literature search, analysis)

Rafael A. Hanssen MD. (Literature search, analysis)

Jorge E. Daes. (Manuscript review and corrections)

#### Registration of research studies

1. Vasomotor Changes in Abdominal Skin after Endoscopic Subcutaneous/Preaponeurotic Repair of Diastasis Recti (REPA). Cases report.

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#### Guarantor

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