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Innovative microsurgical device in perforator free flaps surgery

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SUMMARY: Innovative microsurgical device in perforator free flaps surgery.

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Dissection of the small perforating vessels through the muscle/septum can be difficult, and microsurgical success is closely linked on a clear and well-magnified field vision. Since 2004, Varioscope®M5 has been employed in our Plastic Surgery Departments. It is the first and only head-mounted microscope.

In this study was examined 10 patients underwent to reconstructive procedures by harvest of perforator free flaps, working with Varioscope®M5. At long-term follow-up, all patient present an exceptional outcome.

Considering cost-effectiveness, portability, operator freedom, and effectiveness in the perforator flaps dissection and in the anastomosis making, we think that Varioscope®M5 offers essential advantages.

RIASSUNTO: Innovativo strumento microchirurgico nella chirurgia dei perforator free flaps.

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La dissezione dei piccoli vasi perforanti attraverso il setto intermuscolare può rivelarsi complessa, pertanto il successo microchirurgico è strettamente associato a un campo visivo chiaro e ben ingrandito. Sin dal 2004, nei nostri Dipartimenti di Chirurgia Plastica utilizziamo Varioscope®M5, il primo e unico microscopio montato su caschetto.

Nel presente studio sono stati esaminati 10 pazienti sottoposti a procedure ricostruttive mediante allestimento di lembi liberi nutriti da vasi perforanti, lavorando con Varioscope®M5. Al follow-up a lungo termine tutti i pazienti presentano un risultato eccellente.

Prendendo in considerazione il rapporto costo-efficacia, la trasportabilità, la libertà operativa, l'efficienza nella dissezione dei lembi perforanti e nel confezionamento delle anastomosi, riteniamo che Varioscope®M5 offra irrinunciabili vantaggi.

KEY WORDS: Perforator free flaps - Microvascular anastomoses - Varioscope®M5 - Plastic reconstructive microsurgery.
Lembi liberi perforanti - Anastomosi microvascolari - Varioscope®M5 - Microchirurgia plastica ricostruttiva.

Introduction

Since the development of the first applications in image-guided therapy, the use of head-mounted displays was considered an important extension of existing image-guided operative technologies. Several approaches to utilizing head-mounted displays and modified medical devices for improved reality visualization were implemented (1).

Free microvascular tissue transfers have become to-

day a key instrument for the surgical treatment of wide loss of tissue (2), and the perforator flaps allow the tissue transfer in a reliable approach with minimum donor site morbidity (3). Dissection of the small perforating vessels through the muscle/septum can be difficult, and microsurgical success is closely linked on a clear and well-magnified field vision.

Many methods for microvascular anastomoses exist, including use of magnifying loupes (x2.5 - x6), but the operating microscope remains the gold standard for many surgeons (4). Its drawbacks include high cost, increased operative time because of no automatic adjustment, decreased participation of the first assistant, lack of widespread availability, and encumbrance.

Thus, since 2004, a new device Varioscope®M5 (VM5), that combines the value of microscope and loupe, has been employed in our Plastic Surgery Departments. In this paper, we point out our experience in the reconstructions by perforator free flaps using VM5.

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Patients e methods

Ten neoplastic patients underwent to reconstructive procedures by harvest of perforator free flaps, working with VM5.

VM5 (Life Optic, The Vision Company, Vienna) is the first and only head-mounted miniaturized microscope. It's an optical system that permits complete movement freedom while offering variable magnification, autofocus and a sharp, crystal-clear 3D image, zoom and parallax control with powerful illumination and high-end documentation. This sophisticated high-end head-mounted vision system (Fig. 1) provides a new approach: it miniaturizes the high-end microscope and combines it with the flexibility of a head-mounted system with coaxial light. Its technical data are more advantageous, in particular VM5 is: multifunctional (light, camera option, interchangeable oculars, multivision with further possibilities for data visualization); mobile (working range 300-700 mm with complete movement freedom and extraordinary mobility as regards transportation between operating room); multiuser (variable pupillary distance and individual vision correction); modular (flexibility for the specific needs of users); and it can be used in all fields of surgery. A major advantage of the system is that the field vision is exceptionally wide and includes the entire operation area. Moreover, surgical finesse is also improved, in particular the efficiency in the perforator flaps dissection and in the anastomosis making.

Results

Patients not highlighted failure at 20 days follow-up. One case required exploration because of venous thrombosis. One flap was suffered (< 20%) but there were no total flap loss.

Evaluating parameters recorded during the operation and in the following days of hospitalization, it became noticeable that the loss of blood in operations employing the VM5 was significantly less. Using this device none patient required transfusions, none patient had nerve damage, all anastomoses were functional.

At long-term follow-up, all patient present an exceptional outcome.

Specific advantages have been reduced costs, freedom of movements, portability, a wide magnification range, and a precise operation technique.

Discussion

Perforator free flaps represent an effective therapy for the reconstructive surgery. However a precise operation technique is possible only if the visual conditions are optimal. In 2005, Figl et al. showed that VM5 is a device sufficient in terms of accuracy and time requirements for uses of optical see-through systems in a clinical environment (1). Spyriounis performed several consecutive free flaps using the Varioscope®, in order to evaluate its efficacy; his results show that the Varioscope® could be safely employed in the majority of free-tissue transfers as sole means of magnification (5, 6). Katz et al.



Fig. 1 - The head-mounted Varioscope® M5.

present the daVinci Surgical System as an alternative method for performing microvascular anastomoses. The daVinci® robot has fully articulating microinstruments and in the study authors highlight that multiple microanastomoses were performed in canine tarsal and superficial femoral vessels (4). According to Spyriounis and Katz, operative microscope can be considered the gold standard for vessels with a diameter of less than 1 mm.

Considering cost-effectiveness, portability, operator freedom, and effectiveness in the perforator flaps dissection and to make the anastomosis, we think that VM5 offers essential advantages.

Conclusion

A precondition in microsurgery for a precise operation technique is good visibility. We believe that Varioscope®M5 is a successful device of magnification for

perforator flaps transfers. Because of the improved visualization a better overview of the anatomic structures

and a more careful operation are possible, with better functional results.

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