

Technical Note

The Arabic Question Mark Incision for Superficial Temporal Artery-Middle Cerebral Artery (STA-MCA) Bypass Surgery: A Technical NoteAhmed Hegazy,¹ Hieder A. Al-Shami,² Mohammed F. A. Ali,¹ Emad Ibrahim,³ Arundhatai Biswas,⁴ Amr Mostafa Elkatatny¹¹Department of Neurosurgery, Faculty of Medicine, Cairo University, Cairo, EGYPT; ²Specialist, Egyptian Fellowship of Neurosurgery, Cairo, EGYPT; ³Department of Neurosurgery, The National Ribat University, SUDAN; ⁴Department of Neurological Surgery, Albert Einstein College of Medicine, Yeshiva University/Montefiore Medical Center, New York, USA

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BACKGROUND: Skin flap necrosis is one of the known complications of neurosurgical operations in general and in low flow bypass surgery in particular. We report a technique for using the frontal branch of the superficial temporal artery (STA), while basing the flap on the parietal branch along with the posterior auricular and occipital arteries.**TECHNICAL NOTE:** The main trunk of STA is palpated in front of the tragus. The skin is then incised directly over the vessel. The main trunk is then dissected and followed distally to the bifurcation. The incision then continues distally, within the hairline and over the frontal branch, till adequate length of usable vessel is dissected (preferably not more than 10 cm.). When this point is reached, the incision is curved backwards 90 degrees and continues parallel to midline. The incision then stops at a line coinciding with the posterior margin of the tragus similar to the Arabic question mark (؟). The technique is simply based on an inverted question mark incision rather than a linear skin incision or conventional question mark.**CONCLUSION:** The technique described allows using the frontal division of the STA while performing a skin flap based on the parietal branch, posterior auricular and occipital arteries, in order to allow performing a larger craniotomy, without the fear of cutaneous necrosis, while still remaining within the hair line for good cosmetic results.**KEYWORDS:** Bypass surgery, cerebral revascularization, superficial temporal artery-middle cerebral artery (STA-MCA), technical note.**INTRODUCTION**

Ever since its initial description by Yasargil in 1967, superficial temporal to middle cerebral artery bypass has become an important part of cerebral revascularization.¹⁻⁵ Most techniques describe either a linear, or a question mark incision, each with its own merits and drawbacks.⁴⁻⁸ Skin flap necrosis takes place more commonly when using a flap rather than a direct cut over the desired branch of the superficial temporal artery (STA). The skin incisions described previously usually interfere with blood supply by injury to posterior auricular arteries, occipital artery and parietal division of STA. A skin flap is usually more desirable, when larger areas of cortical exposure are needed, for example in patients with Moya Moya disease. We report a technique for using the frontal branch of the STA,⁹ while basing the flap on the parietal branch along with the posterior auricular and occipital arteries.

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Email: adamhouse73@gmail.com**TECHNICAL NOTE**

After establishment of general anesthesia, patient is positioned, prepped and draped as describe elsewhere. The main trunk of the STA is palpated in front of the tragus and the skin is then incised directly over the vessel. The main trunk is then dissected and followed distally to the bifurcation. The incision then continues distally, within the hairline and over the frontal branch, till adequate length of usable vessel is dissected (preferably not more than 10 cm.). When this point is reached, the incision is curved backwards 90 degrees and continues parallel to the midline similar to the Arabic question mark (؟). The incision then stops at a line coinciding with the posterior margin of the tragus (**Fig. 1**). The scalp incision base and limits with good exposure of temporal area for craniotomy is demonstrated (**Fig. 2**). The frontal division is clearly visible, dissected and ready for bypass with accepted length and caliber (**Fig. 3**). The frontal branch as extension of the main stem of STA was successfully anastomosed to middle cerebral artery (MCA) branch (**Fig. 4**).

Informed Consent

An informed consent was taken from the patients.



Fig 1: Left STA-MCA procedure. Incision is totally included within the hair area. The hair area is enclosed with a dotted line. The vertical limb is beyond the hairy margin in front of tragus and the posterior horizontal limb is encroaching the superior temporal line.



Fig 2: The wound is exposed prior to craniotomy. 1: Left STA, 2: Deep temporal fascia, 3: Scalp retracted.



Fig 3: Clear demonstration of the left STA before craniotomy.

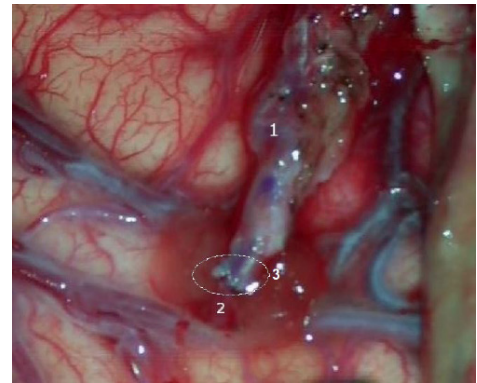


Fig 4: Intraoperative image of a successful STA-MCA bypass. 1: Left main stem and frontal division. 2: MCA terminal branch. 3: Anastomosis site.

DISCUSSION

Our findings show absence of skin flap necrosis in all five patients operated using this technique. The technique also facilitated the performance of a large craniotomy to suit all indications included in the study.

The technique accordingly, provides an opportunity for using the frontal branch of the STA, which is usually of a larger caliber,¹⁰⁻¹⁴ while performing a larger craniotomy to facilitate finding of a good recipient vessel.

In an analysis of 47 cases Katsuta T. et al. demonstrated skin flap necrosis to be more common in patients undergoing the procedure through a skin flap rather than a linear incision. They also demonstrated that cutaneous flap necrosis is more common in patients with a poor general condition and more severe atherosclerosis.⁹ However, locating a good recipient is one of the problems frequently encountered with a linear incision.^{15,16} The best recipient vessel is usually deep to the parietal branch of the STA. Furthermore, the small size of the craniotomy offered by the linear incision created over the parietal division of the STA does not always guarantee finding a good recipient, this is perhaps the reason many authors have devised techniques for targeting a good recipient.¹⁵⁻¹⁷ Also, the parietal branch is usually the smaller of the two divisions of the STA^{4,18,19} In patients with Moya-Moya disease, a larger cortical exposure is needed for mysinangiosis.^{14,20} Also, splitting the Sylvian fissure, when exposure of the M2 is required, is much easier to perform through a larger craniotomy, when an STA-M2 bypass is needed for aneurysms.^{2,13}

The technique described for the performance of the skin flap can be clinically applied in all forms of superficial temporal artery-middle cerebral artery (STA-MCA) bypass either for flow augmentation or flow replacement.

The small number of patients included in the study and lack of a randomized controlled study to compare the technique with other techniques makes it difficult to draw solid statistical conclusions regarding this technique.

Also, the dissection of the frontal division of the STA may be associated with a higher incidence of injury to the frontalis branch of the facial nerve. However, with careful dissection techniques this branch can be located and avoided.¹⁹

Further work is needed to determine the best technique for performing this procedure. A randomized controlled study on a larger group of patients is needed to determine the best technique available for the performance of this important procedure.

CONCLUSION

The technique described allows using the frontal division of the STA while performing a skin flap based on the parietal branch, posterior auricular and occipital arteries, in order to allow performing a larger craniotomy, without the fear of cutaneous necrosis, while still remaining within the hair line for good cosmetic results. The previous incisions deprive the flap of posterior auricular arteries, occipital artery and parietal division while our technique allows the flap to be based on the arteries described above.

List of abbreviations

MCA: Middle cerebral artery.
STA: Superficial temporal artery

Disclosure

The authors report no conflict of interest in the materials or methods used in this study or the findings specified in this paper.

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