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# Intradermal Sutures in Neurosurgery – Consecutive Series of 1322 Neurosurgical Interventions

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## Abstract

**Background:** Previous reports on the techniques used to close surgical incisions in neurosurgical practice are very scarce. The traditional technique consists of interrupted closure with percutaneous non-absorbable sutures or staples.

**Objective:** The aim of this report was to investigate the safety, efficacy and patient perception of intradermal sutures applied non-selectively in all cranial, spinal and peripheral nerve neurosurgical interventions.

**Methods:** Our series includes 1322 neurosurgical interventions performed during a 5-year period from January 2014 to December 2018: 804 cranial, 504 spinal and 14 peripheral nerve interventions. We adhered to a protocol for closure involving the use of percutaneous running sutures with absorbable material in all cases. Wound healing was examined 24 h after surgery, 7 days after surgery and during the follow-up period. The mean follow-up was 14 months (range 1 week to 36 months).

**Results:** We observed 4 wound complications (0.3%) in this mixed neurosurgical series–2 bone flap osteomyelitis requiring bone flap removal and 2 superficial skin infections successfully treated by wound revision and antibiotics. All 4 complications were in the cranial group. All patients except these 4 complicated cases expressed their satisfaction regarding the absence of need for suture removal and the cosmetic results.

**Conclusion:** Our results suggest that intradermal sutures may be used routinely in all elective neurosurgical procedures–cranial, spinal or peripheral nerve interventions. This suturing technique is safe and fast to perform and achieves good cosmetic results.

**Keywords: Cosmetic results; Incision closure; Intradermal sutures; Wound complications**

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## Background

Several types of closures may be used to close the surgical incisions at the end of cranial, spinal or peripheral nerve neurosurgical interventions–percutaneous or intradermal stitches using interrupted or running sutures with absorbable or non-absorbable material. Papers focusing on this final step of neurosurgical operations are scarce [1,2]. The traditional practice consists of percutaneous interrupted closure with non-absorbable sutures or metallic staples. Since 2014, our team adopted a protocol of intradermal running sutures with absorbable material for all neurosurgical interventions. The aim of this report was to investigate the safety, efficacy and patient perception of this method.

## Methods

Our series includes patients operated upon during a 5-year period from January 2014 to December 2018, and the skin closures were performed by one of the three leading authors (KM, EN, KG). One thousand three hundred twenty-two consecutive neurosurgical interventions were performed during this period. There were 118 reoperations (8.9%) and 247 interventions in children (18.7%). The series included 804 cranial operations, 504 spinal and 14 peripheral nerve interventions. The distribution of the patients according to surgical procedure and disease is presented in Table 1. Emergency trauma procedures were excluded because percutaneous stitches were usually applied. Chronic subdural hematomas, late spinal decompressions and stabilizations or delayed peripheral nerve repairs following traumatic injury were included in our study. This series included shaven and unshaven patients. Povidone iodine was used to scrub the skin of the patients

**Table 1:** Distribution of the patients according to surgical procedure and disease.

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|---|
| Functional diseases: Epilepsy, Trigeminal Neuralgia or Hemifacial Spasm |
| sdhd: Subdural Hematoma Drainage |
| lpa: Lumboperitoneal Anastomosis |
| vpa: Ventriculoperitoneal Anastomosis |

**Figure 1**: Wound appearance one week after intradermal sutures.

Figure 1. Sterile drapes and translucent adhesives were then applied. The adult patients received 2 g of intravenous ceftriaxon prophylaxis before skin incision, and children less than 50 kg received 50 mg/kg of ceftriaxon. In cases with an open ventricular system or spinal implants, we continued the antibiotic prophylaxis for three days after surgery. Subcutaneous drainage was used in cases with supratentorial craniotomies, and epidural drainage was applied for large spinal decompressions. Intradermal running sutures were made using 3-0 or 4-0 absorbable suture material. Sterile occlusive dressings were applied at the end of the operation. Drainage, if present, was removed, and the dressings were always changed 24 h after the operation. No others procedures were performed, and the second dressing was removed 7 days after the surgery. Patients were allowed to wash the surgical incision by the eighth postoperative day. Wound healing was examined 24 h after surgery, 7 days after surgery and during the follow-up period. The mean follow-up for this series was 14 months (range from 1 week to 36 months). Wound complication was defined as the presence of greater-than-normal erythema, drainage, wound separation or wound-edge necrosis.

## Results

We observe 4 wound complications (0.3% complications rate) in this mixed neurosurgical series–2 bone flap osteomyelitis requiring bone flap removal and 2 superficial wound infections treated by wound revision. No wound-edge necrosis was observed. The average speed of intradermal skin closure after 1 year of training was 3 cm/min, which is comparable with the average speed for skin closure achieved using percutaneous stitches with non-absorbable material. The cosmetic results were satisfactory for all patients without wound complications.

## Discussion

Skin closure is the final and probably the easiest step of each neurosurgical intervention, but underestimating its importance may have serious consequences. The intradermal sutures save time (no need for more than one postoperative dressing), reduce patient discomfort (no need for suture removal, which is especially important in children) and improve cosmetic results (no suture marks). The low rate of complications (0.3%) seems logical because of the good dermal and epidermal approximation and the absence of foreign material connecting the skin surface and the subcutaneous space, which is present in patients with percutaneous sutures or staples. Wound closure has rarely been discussed in the neurosurgical literature, probably because of the low rate of wound complications in neurosurgical practice [3]. Cho have described cyanoacrylate glue skin closure in cases with limited-skin incisions for small craniotomies. Paolini reported a low rate of complications (0.96%) after intradermal sutures of elective craniotomies–1 case of cerebrospinal fluid leakage and another case with superficial skin infection. There are more papers on this topic outside of the neurosurgical area. Gal [4] conducted an experimental study on rats and found that the wound tensile strength of intradermal running sutures is significantly higher than that of simple interrupted percutaneous sutures. A low rate of complications, positive aesthetic results and patient preference were reported for clean dermatological, cardiac and general surgeries [5-7]. The clean character and the low wound complication rates for the majority of the neurosurgical interventions suggest more widespread application of intradermal sutures in neurosurgical practice.

## Conclusion

Our results suggest that intradermal sutures may be used routinely in all elective neurosurgical procedures–cranial, spinal or peripheral nerve interventions. This suture technique is safe and fast to perform and achieves good cosmetic results.

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