

# PINNA SENSATION AFTER POST AURICULAR SKIN INCISION

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## INTRODUCTION

Post-auricular incisions are performed for a range of ear surgical procedures. We normally use a skin crease incision, extending from behind the root of the lobule, up to near the superior aspect of the pinna. We have noted that in many cases, sensory loss occurs over the upper pinna after this type of incision. This is one of only two identified studies to quantitatively measure touch sensation of the pinna distal to retro-auricular incision. The sensory loss principally affects areas of the pinna supplied by the Lesser Occipital and the Greater Auricular nerves, and is less marked in patients tested many months after surgery than those that were tested early. Younger age appears to confer less sensory loss.

## AIM

To assess touch sensation of the pinna after post auricular incisions made in the skin crease for ear surgery, such as Myringoplasty, Tympanoplasty, Meatoplasty and various types of Mastoidectomy.

Our incision is a single layer incision carried from skin down to bone, with no subcutaneous soft tissue flaps in the majority of cases.

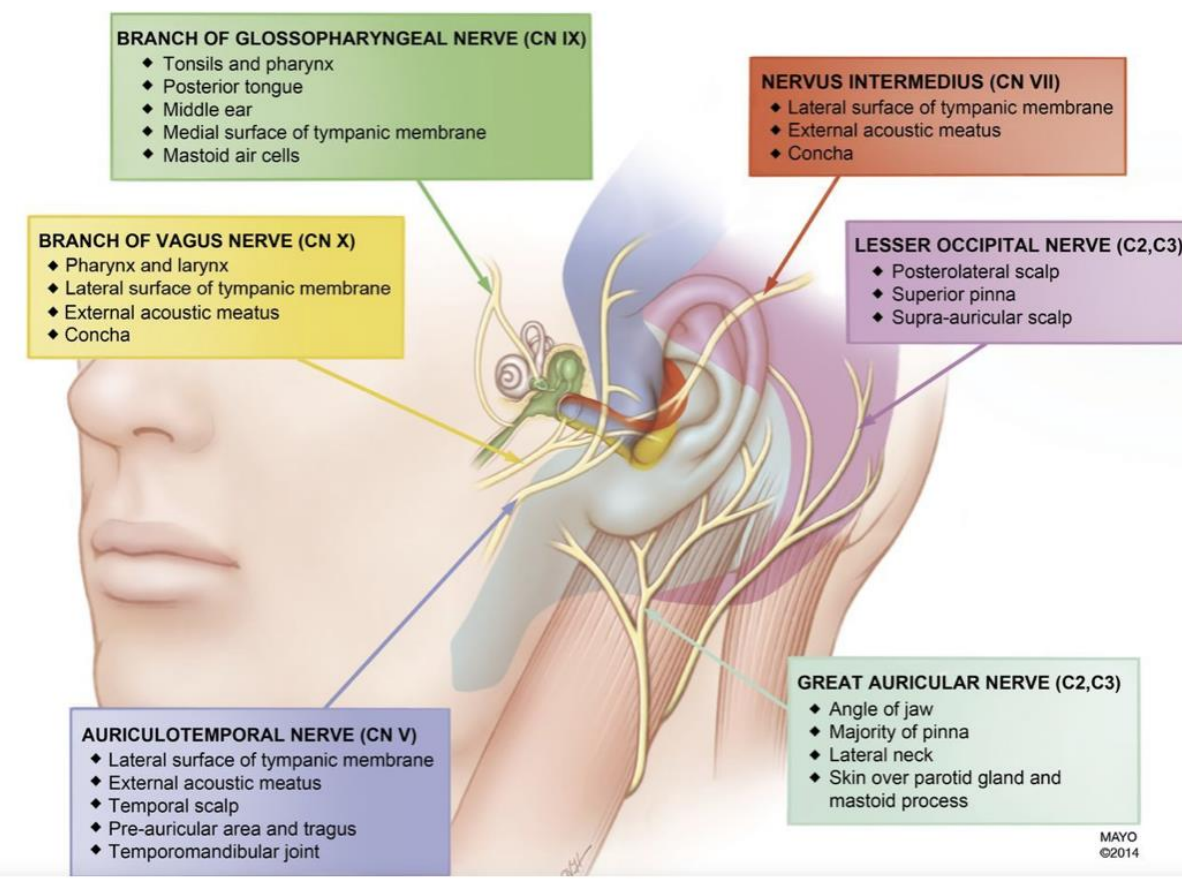
We had the impression that the initial sensory loss or numbness of the upper pinna sometimes described by patients improved with time and we wished to test this hypothesis.

We also hoped to define the areas of any sensory loss and see whether this should influence positioning of the incision.

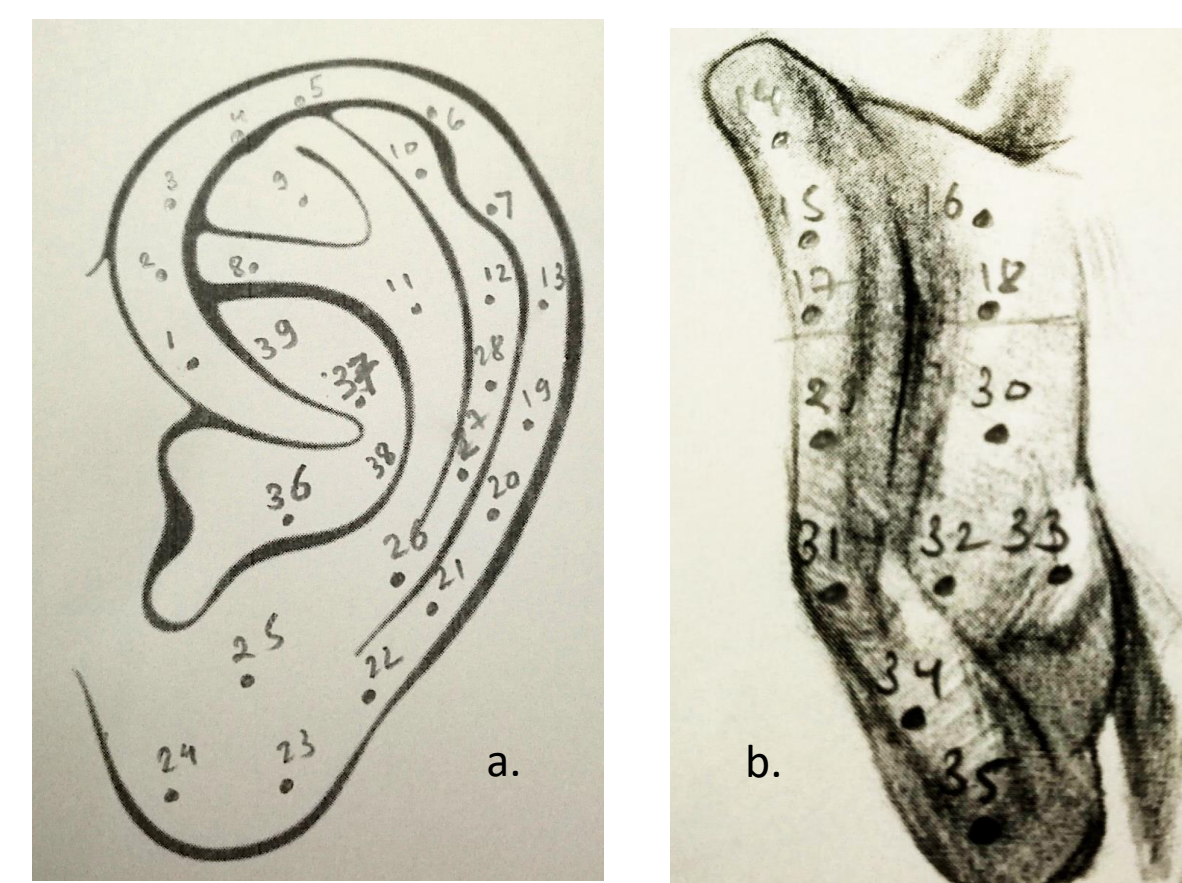
## METHOD

- A retrospective study of 119 patients attending follow up. All had primary surgery between 2016 and 2020. They were assessed for touch sensation over different regions of the lateral and medial surfaces of the pinna.
- Tests were at varying time intervals since surgery. (Of the 119 patients, 8 were tested twice, the remainder were tested once).
- Six graded diameter Semmes-Weinstein (SW) nylon monofilaments of equal lengths (4cm), with bending forces of 0.05, 0.20, 2.0, 4.0 and 7.5 gm respectively were used. This is a recognised and cost-effective methodology used in leprosy (Hansen's disease), diabetic and skin flap neurosensory assessment and management<sup>1, 2, 3</sup>.
- The non-operated ear was used as a control, all patients could detect all filaments in all tested areas on the control side.
- There is a well recognised overlap and variability in cutaneous sensory nerve distribution in the pinna. Therefore, numerous points were tested on each auricle and these were used to assess loss in each widely accepted sensory nerve area.
- Testing occurred at post-op times varying from 1-48 months (mean 6.8 months).

## RESULTS



Sensory Innervation of pinna, with approximate areas of nerve distribution

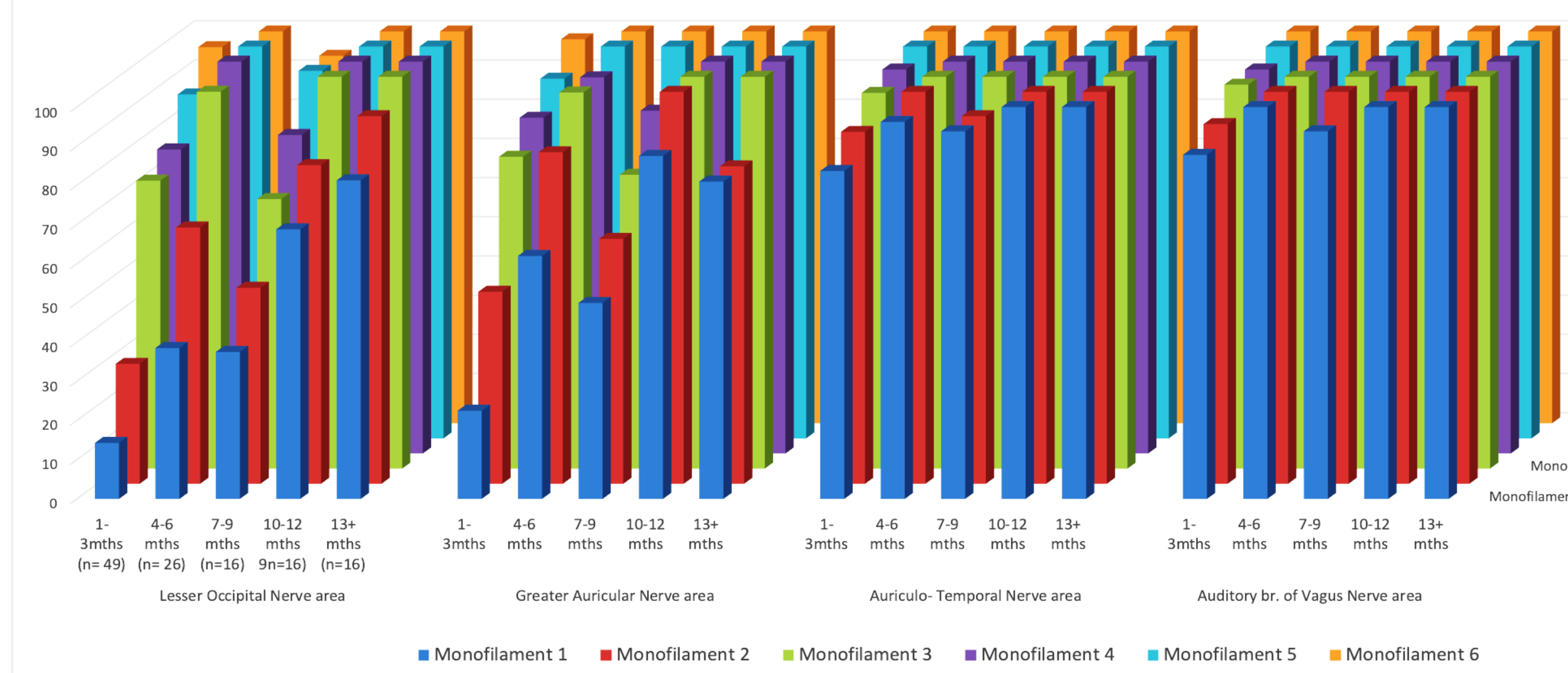


a. Lateral aspect of pinna b. Medial aspect of pinna

### The points tested with each monofilament, for touch sensation:

- Points 1-5: Approximate to the area of the Auriculo-Temporal nerve (ATN) (lateral aspect of upper pinna).
  - Points 6-19: Approximating to the area of the Lesser Occipital nerve (LON) (Superior margin and posterior surface of helix, glasses contact area).
  - Points 20-35: Approximate to area of the Greater Auricular nerve (GAN) (Mid pinna and lobe).
  - Points 36-39: Approximate to the Auricular Branch of the Vagus nerve and Nervus Intermedius part of VII (ABVN) (Concha).
- After testing at each of these points, the results were averaged for each of these anatomical areas, and sensation then recorded as positive or negative for that area, for each size of monofilament.

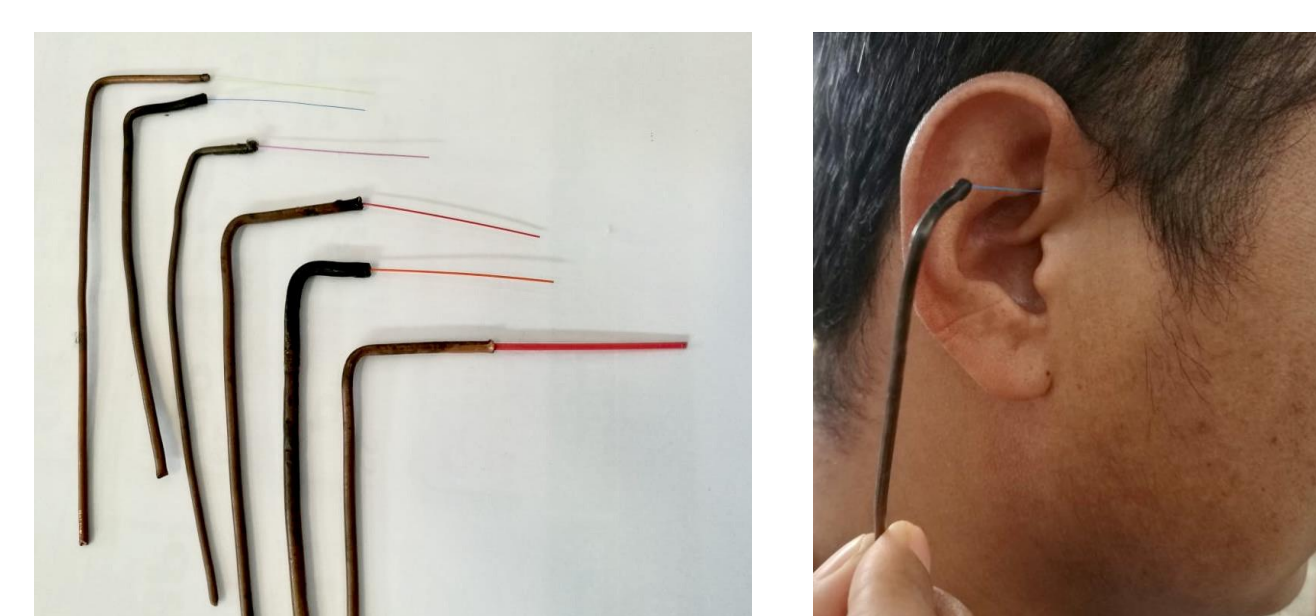
Percentage of subjects with a positive response to touch sensation in each sensory area of the pinna, for each monofilament size, at each time interval since surgery



The bar chart above, Thicker monofilaments, sizes 4-6 (purple, turquoise and orange bars), retain near 100% sensation in all areas of the pinna. Thinner filaments, sizes 1-3, especially for the thinnest filaments, 1 and 2, (blue and red bars) shows reduced sensation, mainly in the distributions of the Lesser Occipital and the Greater Auricular nerves, i.e., the lateral and medial surfaces of the mid pinna and helix.

### Monofilaments used for testing

Sizes: 1 (thinnest) to 6 (thickest).  
Filament length: 4cm.  
When applied firmly enough to induce slight bend in filament, the respective tip pressures are approx.: 100mg, 200mg, 2gm, 4gm, 10gm, and 30gm.

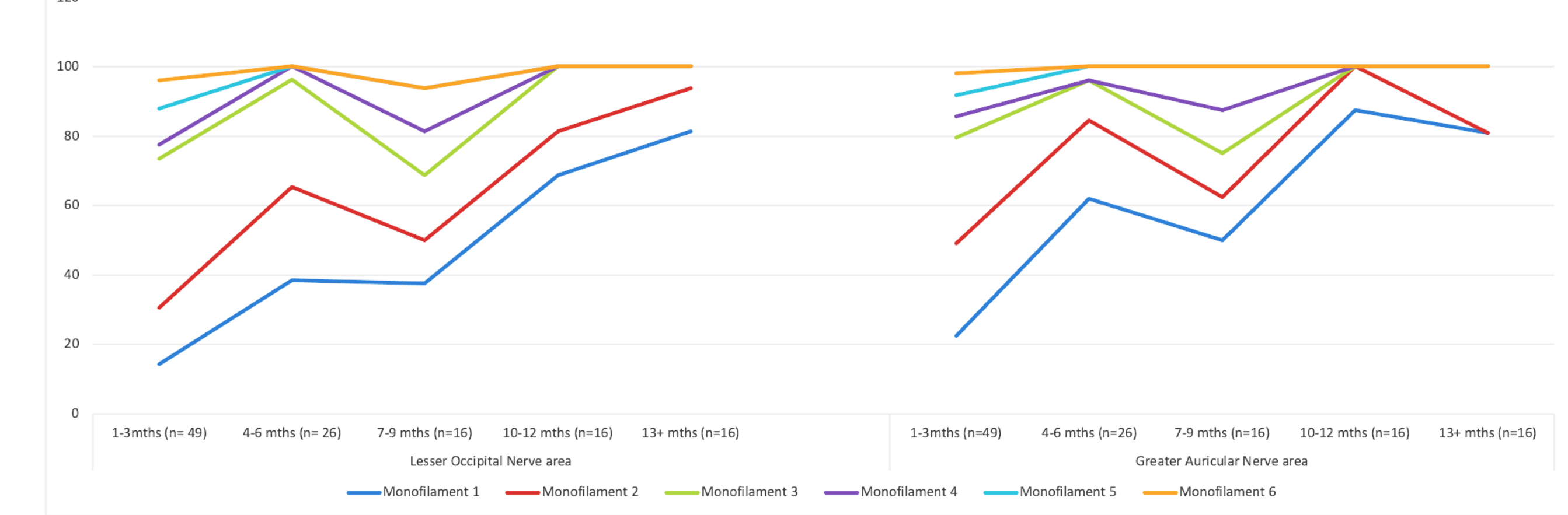


Age ranges of subjects when tested

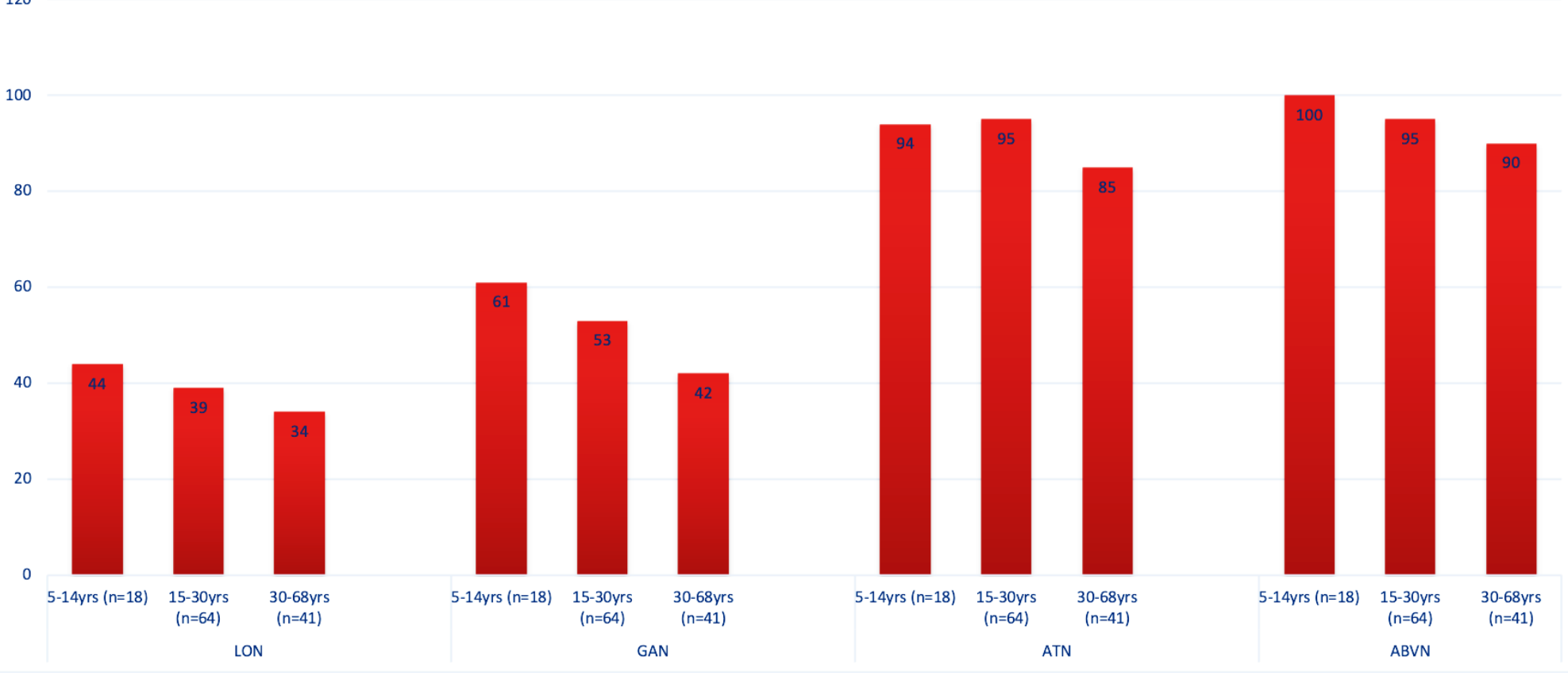
| Age         | Male | Female | Total |
|-------------|------|--------|-------|
| 5-14yrs     | 8    | 10     | 18    |
| 15-30yrs    | 22   | 42     | 64    |
| 30-68yrs    | 8    | 33     | 41    |
| Total tests | 38   | 85     | 123   |

The graph below, improved light touch sensation at later follow ups. In the nerve distributions principally affected, (the Lesser Occipital and Greater Auricular nerves), sensory loss affects more people early than late postoperatively. Most loss is for fine sensation only. The percentage of patients with better sensation is still rising at more than 1-year post-op.

Percentage of subjects with positive touch sensation for each monofilament, in the two areas of the pinna subject to most initial sensory loss, (with improvement over time since surgery)

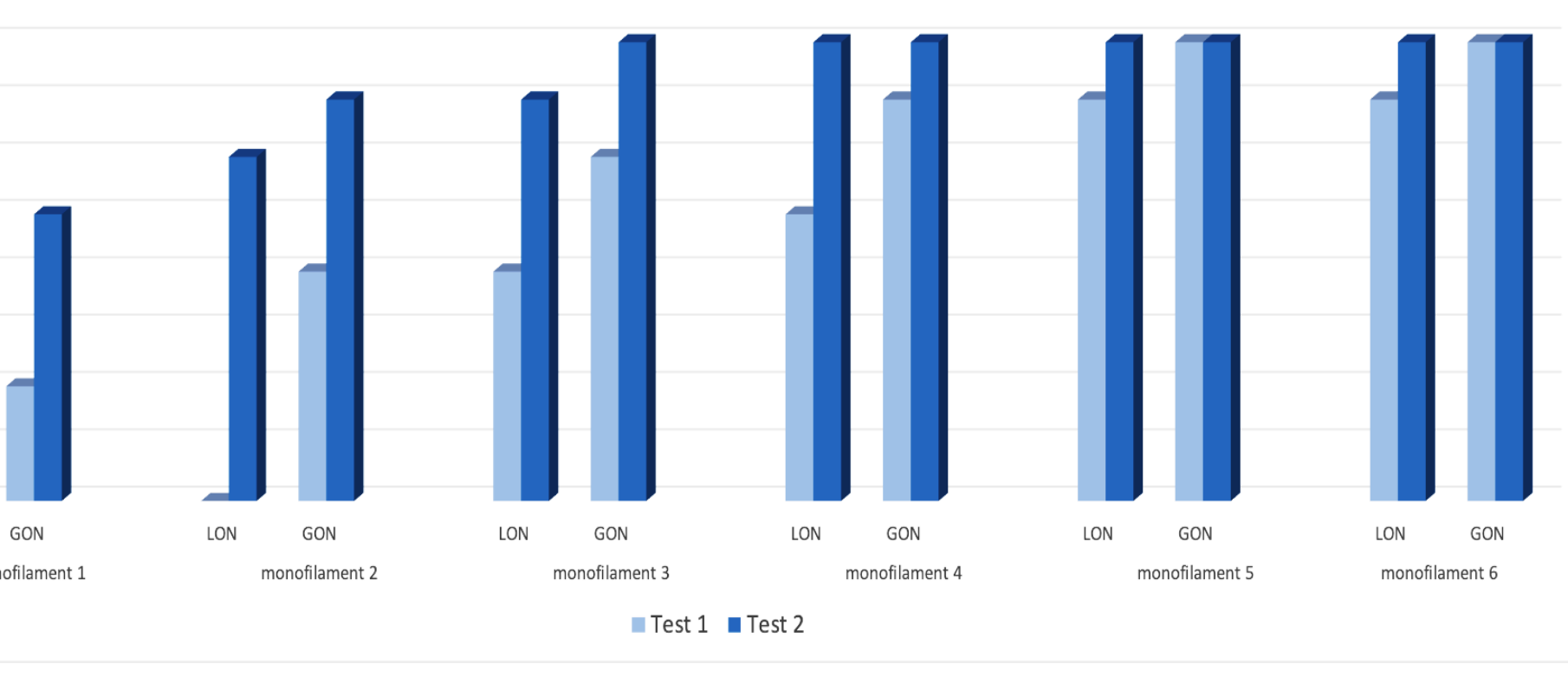


Percentage with positive sensation to filament 1 in each nerve area, for each age group



The effect of age  
Younger patients had better light touch sensation, in all regions of the pinna for all the four nerve distributions.

Number of subjects (8) followed and tested twice, having positive touch sensation to each monofilament, in the two nerve areas most prone to sensory loss (LON and GAN), (mean time interval 5.9 months range, 2-16 months).



Same subjects at sequential testing  
Although there were 123 sensory tests performed overall, on 119 patients, it is a weakness of this study that due to difficulties in obtaining adequate follow up in Nepal, only 8 of these assessments were repeated tests on the same patients. For this reason, we have here analysed those 8 patients. For clarity, we only show the two nerve distributions principally affected. In every case fewer subjects have sensory loss at follow up, and that this applies to both nerves and for all filament thicknesses. This is consistent with the study overall.

## DISCUSSION AND CONCLUSIONS

- Recovery in facial sensation has been previously noted after parotidectomy, with division of the Greater Auricular nerve (GAN)<sup>4, 5</sup>.
- One previous, prospective, study<sup>6</sup> of 25 patients, with ear incisions placed 1 cm behind the postauricular skin crease demonstrated similar findings to ours. They noted most sensory loss in the medial surface of the mid pinna (mainly supplied by the Lesser Occipital and Greater Auricular nerves), their maximum follow up was 6 months. They found that most recovery occurred within 3 months. Their patients were older (mean age 48yrs), they found no variation between types of middle ear and mastoid surgery.
- Mechanism of recovery is speculative, perhaps including neurapraxia of some fibres, neural regeneration, or increased sensitivity to overlapping nerve areas.
- Initial hypo-aesthesia is probably more common than surgeons recognise, as many patients do not volunteer this symptom, which we have shown may affect up to 90% to a variable and often minor degree. However, 20% may have some residual loss even after 1 year to light touch in the distribution of the Lesser Occipital and Greater Auricular nerves.
- It appears that placing the lower part of the incision 1 cm further posteriorly to ours may spare some of the distribution of the GAN, although this and the one previous study cannot ensure this. We have used our incision for many thousands of cases and have encountered no other problem, the main advantage is that the scar is entirely hidden.
- Although one can imagine that reduced sensation in the area of the upper pinna may affect activities such as wearing spectacles, or injury when combing or brushing hair, we have yet to hear a patient complain of these problems, some mention that the upper margin of the pinna feels 'dead' or numb. Such complaints usually occur at early postoperative follow up but are not normally mentioned at subsequent appointments.
- It is safe to reassure patients that any loss will significantly improve and approach normal levels within the first postoperative 3-12 months.

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## ACKNOWLEDGEMENTS

Dr Wim van Brakel gave invaluable advice about sensory testing, from his lifetime of experience testing cutaneous sensory deficit in leprosy

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