Custom Cervical Orthotic Based on Patient's Anthropometry

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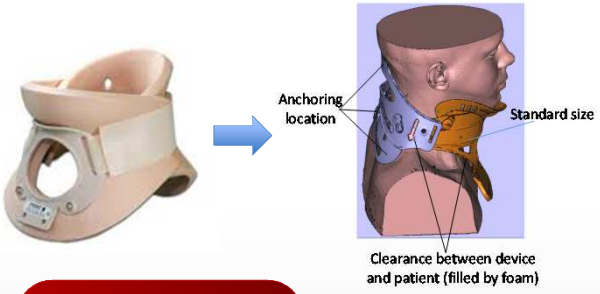
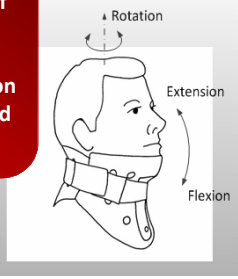
Introduction

- Current generation of cervical orthotics are not optimal for many patient's pathology
- Current generation of cervical orthotics are not capable of being tailored to a patient, using only standardized sizes
- Lack of shape conformity often causes insufficient restriction of the cervical movements such as flexion and extension
- Traditional cervical orthotics are largely insufficient in immobilizing patients during either therapeutic treatment or post-surgical recovery
- **The goal…customizable cervical orthotics**



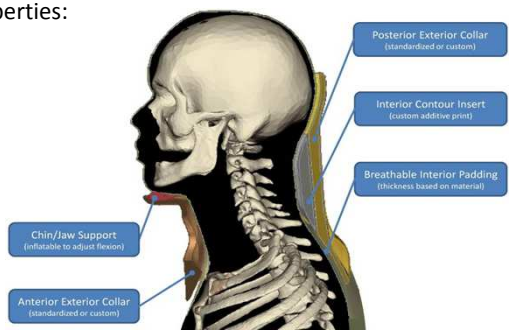
Extension & rotation **of the neck is undesired many treatments including hyperextension injuries and central cord syndrome**



Research Objectives & Parameters

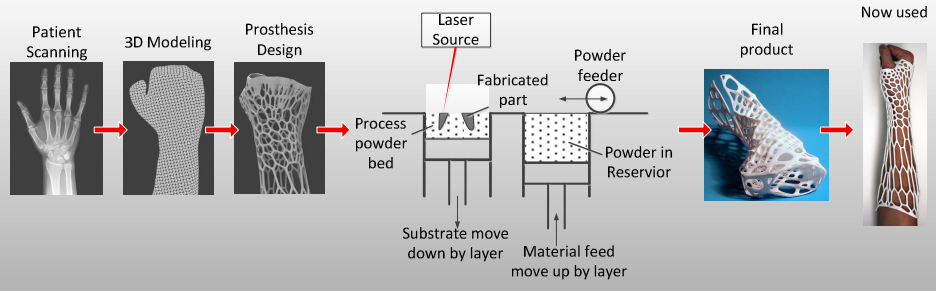
Design the next generation cervical orthotics that could achieve be custom designed for each individual patient with these properties:

1. Custom contour insert
2. Replaceable insert
3. Allow for zero extension
4. Other motions controlled
5. Comfortable
6. Short production time



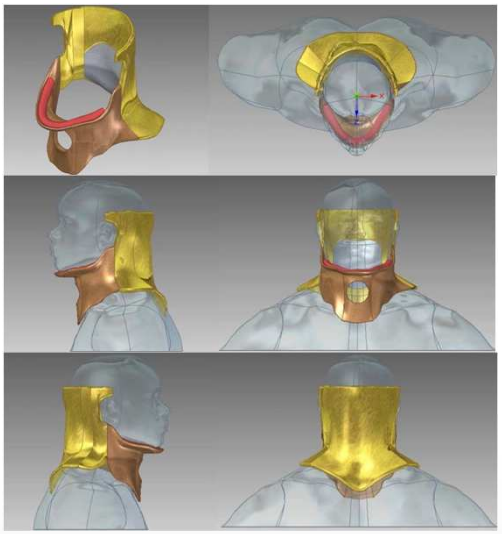
Methods & Technology

- Two potential paths to success
  - Full customization (entire device custom fit to patient)
  - Partial customization (standard shell + custom insert)
- Customization data can be obtained via MRI/CT scan
- Developed virtual models use individual data to render patient specific collar
- Patient collar fabricated using additive manufacturing (a.k.a. 3D printing) such as selective laser sintering and material jetting.



The Next-Generation Orthotic

- Two-piece shell design with insert
- Collar stabilization points
  - Jaw (mandible)
  - Upper back (T1-T3 Vertebra)
  - Upper chest (sternum)
  - Crown of the skull (opisthocranion)
  - Just above the ears (frontal to apex)



- *Zero Extension.* Posterior design creates support between parietal/ occipital skull and high thoracic cage
- *Insert.* A foam or polymer insert can be created to the space between the orthotic and neck (patient specific).

APPLICATION

- *Worker/civilian.* Average cervical injury occurs to people under 35 year old with poor return-to-work rate
- *Military.* Soldiers are highly trained and cervical injuries happen in the field with many not returning to full duty