# RatchAdapt

Improving workplace safety for mechanics with an ergonomic and adjustable redesign of an electric ratchet

## Design Criteria

- Identify a safety hazard in a work environment to improve upon
- Collaborate with the end user through each step of the design process

**Provisional Utility Patent: # 63/488,360**

# Problem Space Research

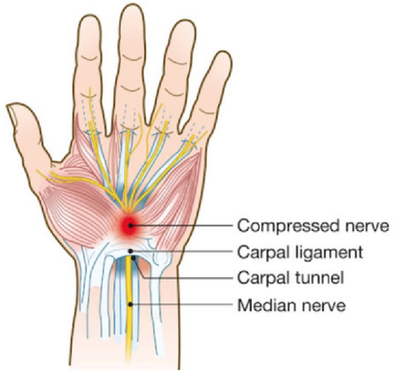
Mechanics use both pneumatic and electric ratchets to loosen or tighten bolts while servicing vehicles.

Due to the linear design and trigger location, ratchets are limited to one type of grip.

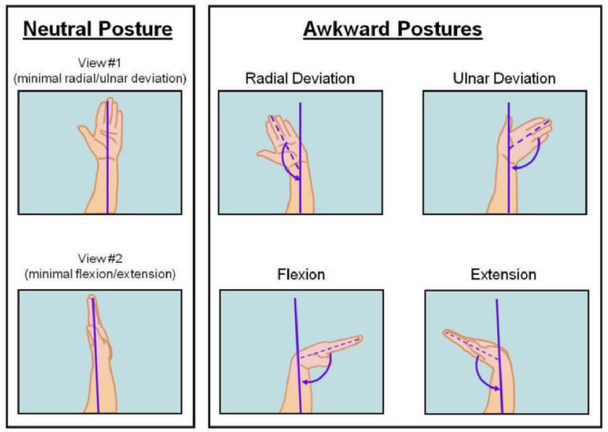

Industry Standard Example:
Milwaukee M12 Extended Reach Ratchet

Since the bolts are in small hard to reach places, mechanics have to twist their arms, wrists, and back in unnatural positions to use the tool.

Mechanic servicing engine bay




Carpal tunnel is the compression of the median nerve due to strain and repetitive wrist movements, causing pain and numbness



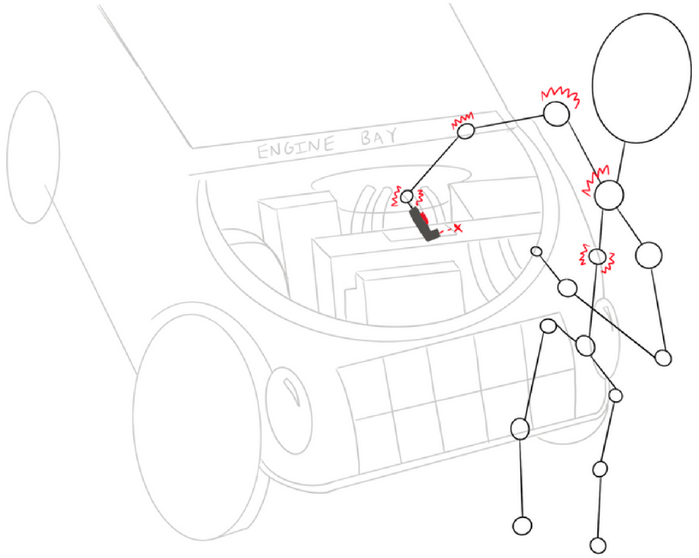

**56%** of Illnesses reported to the Occupational Safety and Health Administration are **Ergonomic Disorders**

**20%** of reported injuries by mechanics were caused by **repetitive trauma**

The Bureau of Labor Statistics

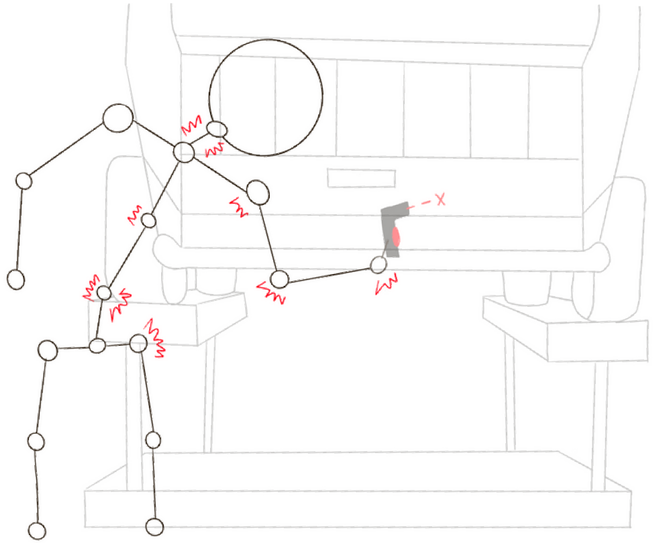
Conclusion:
A ratchet that allows neutral wrist positions will improve safety conditions for the mechanic.

# Most Common Grips & Reaches




## 1 Up & Over

- Vehicle is on the floor
- Bolt is located above chest level

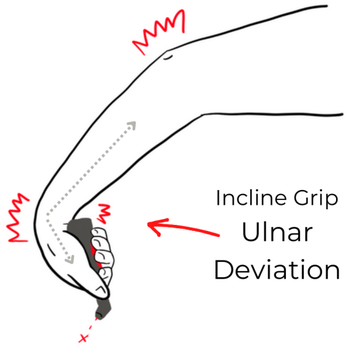


## 2 Under & Up

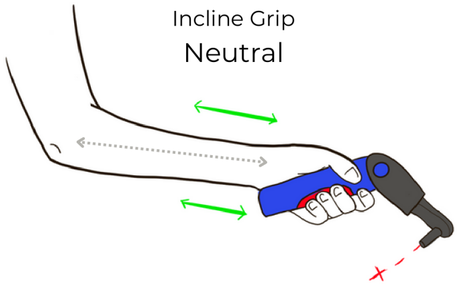
- Vehicle is on a lift
- Bolt is located below chest level

I observed the users holding the current ratchets with unnatural arm positions and wrists bent in an extreme degree of motion.

To avoid injuries such as carpal tunnel, the wrist needs to be in a straight, **neutral position.**

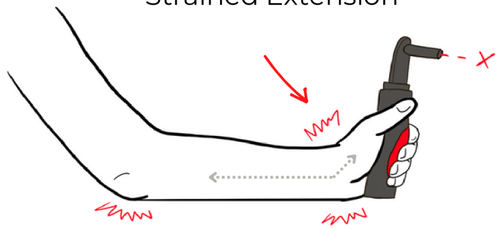


Incline Grip
Ulnar Deviation

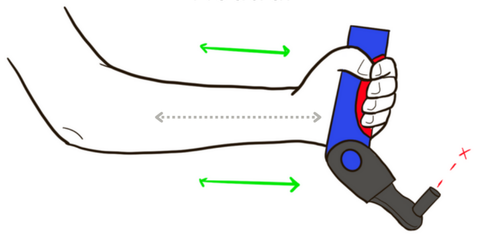


Incline Grip
Neutral

Pistol Grip
Strained Extension



Pistol Grip
Neutral

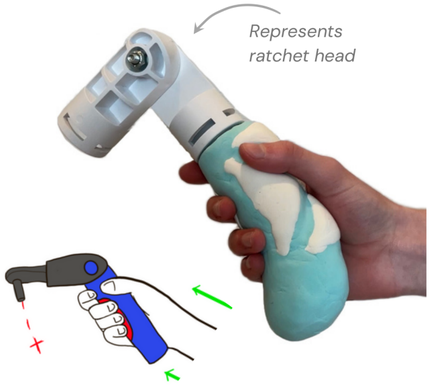


A ratchet with adjustable angles will allow the mechanic to **bend the tool, not their wrist.**

# Form Ideation

1

**Symmetric Design**
for ambidextrous grips




**Common Grip #1**
held w/ pivot on top
*(Up & Over use case)*

**Common Grip #2**
held w/ pivot on bottom
*(Under & Up use case)*

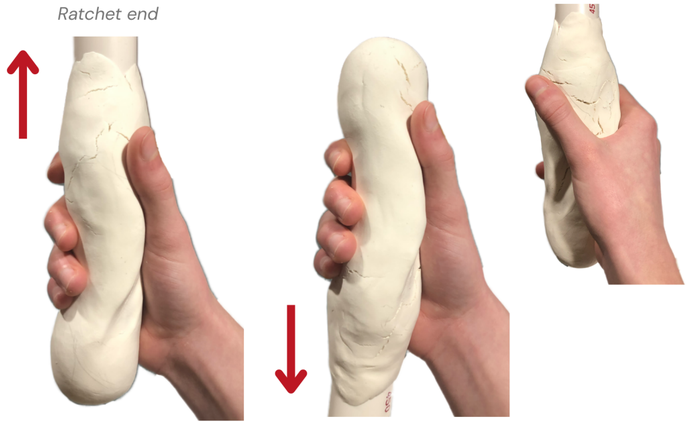
2

**Linear Profile Adjustments:**
Unnecessary bulk removed to better fit in tight spaces

"X" Design still doesn't clearly corelate with grip, *still needs refinement*

3

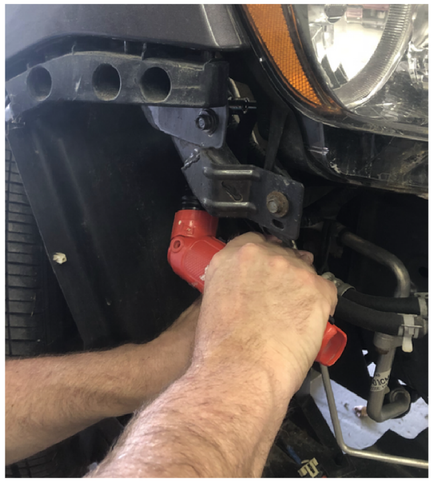
**Enhanced Contours** for stronger grip




**Improved Use of Color**
to signify intended grip

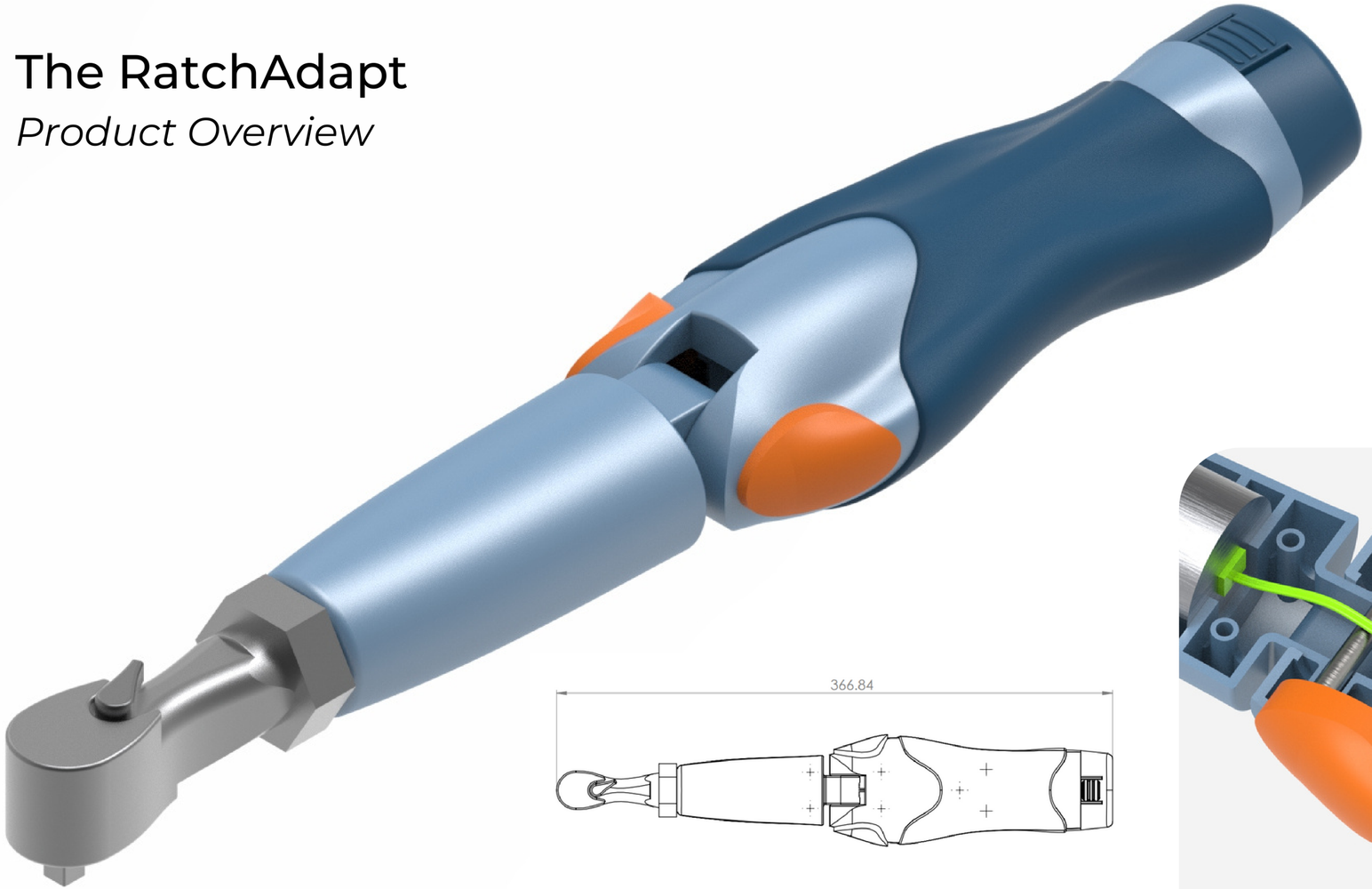

4

Along with the grip models, users also tested a mockup of the angle adjustments for proof of concept.



# The RatchAdapt

*Product Overview*

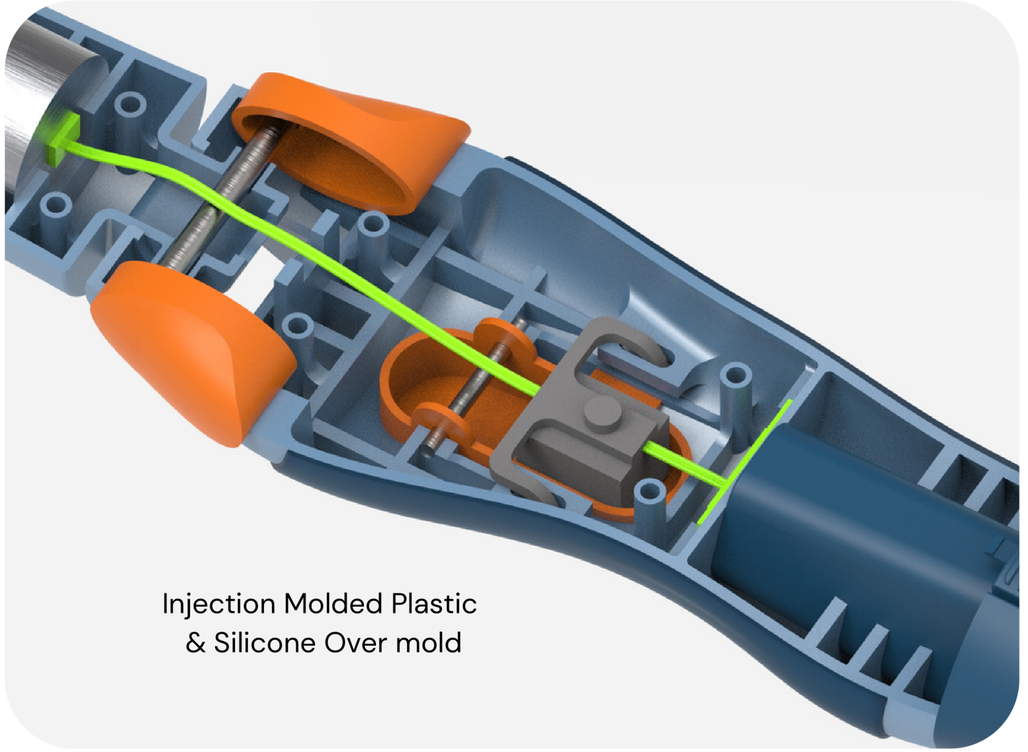





Dimensions

## Features:

- 4-way ergonomic grips
- Adjustable reach
- Improved user safety

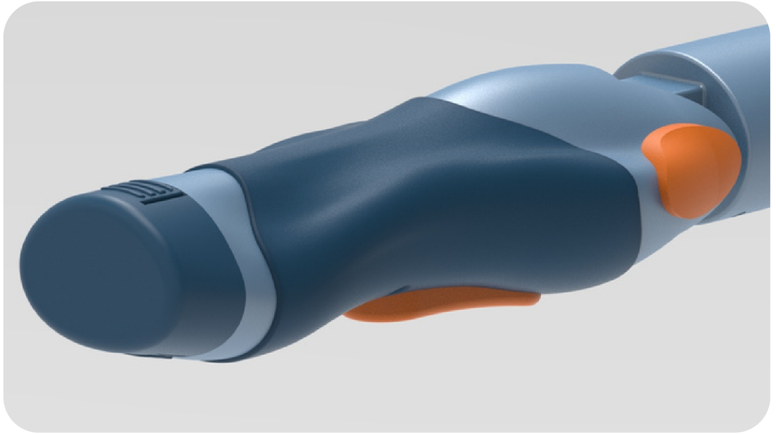


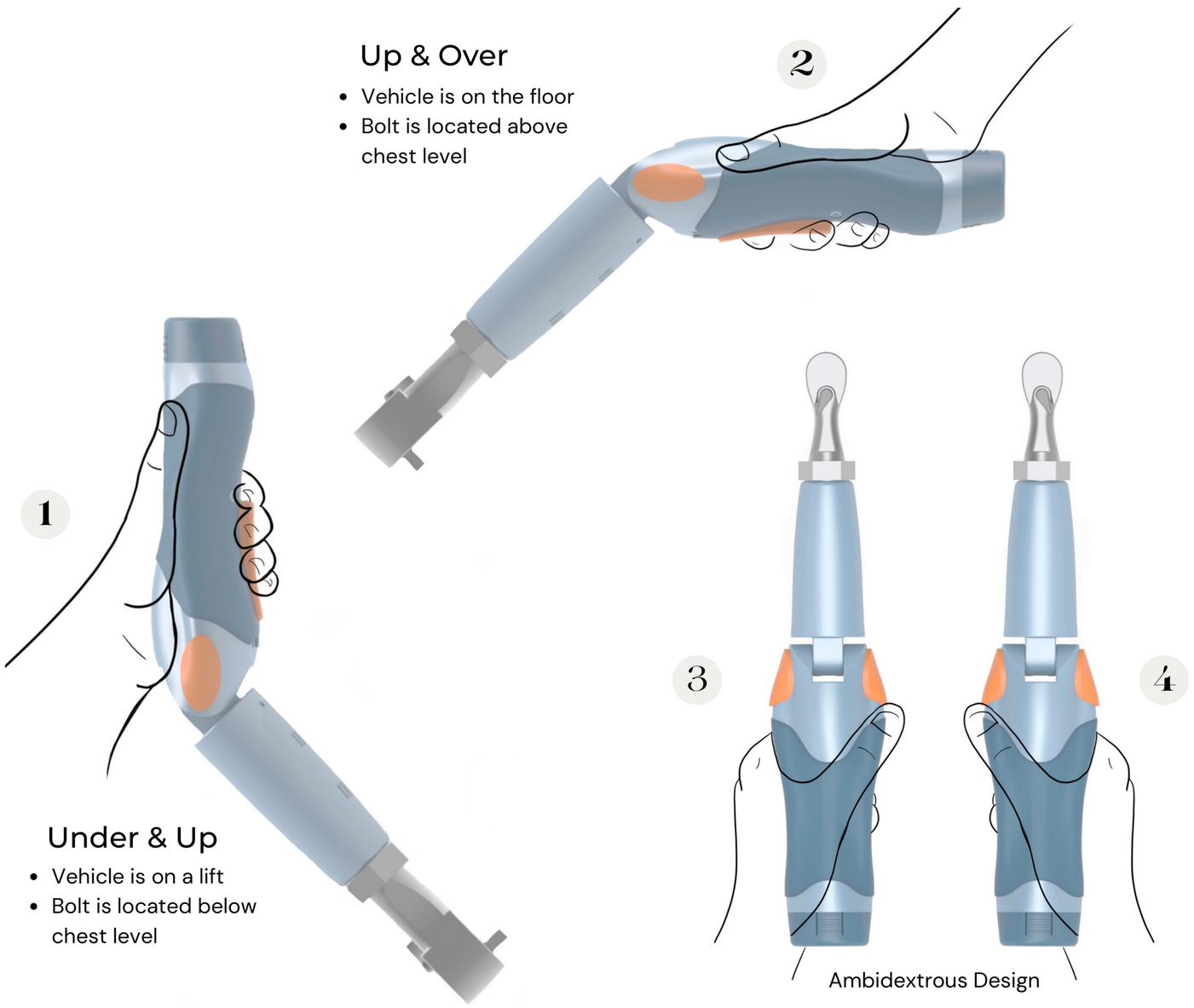
Injection Molded Plastic
& Silicone Over mold

# Grip Features: 4-Ways to Hold

## User Safety Improved by:

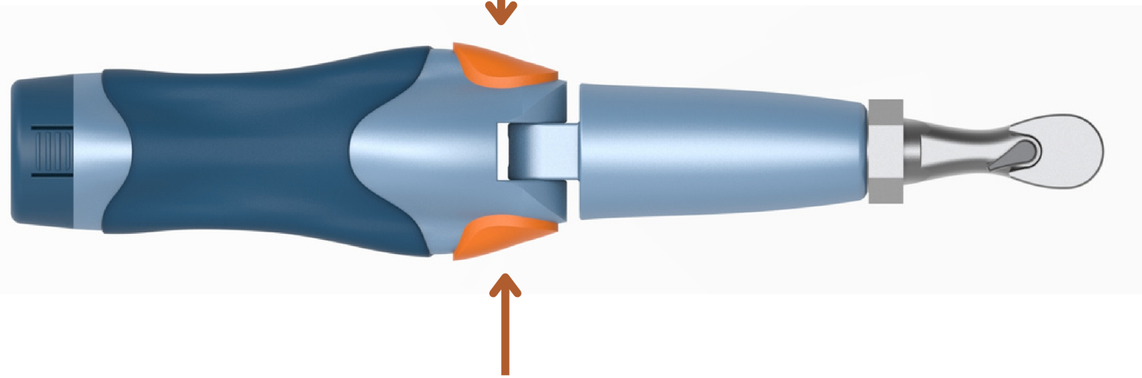
- Ergonomic shape increases grip strength, improving control over the tool
- Unique design and trigger placement allow tool to be held 2 different ways to cater to wrist neutrality
- User needed a slim design: tool fits into the tight spaces needed to prevent crushing or pinning their hand against hot or sharp metal





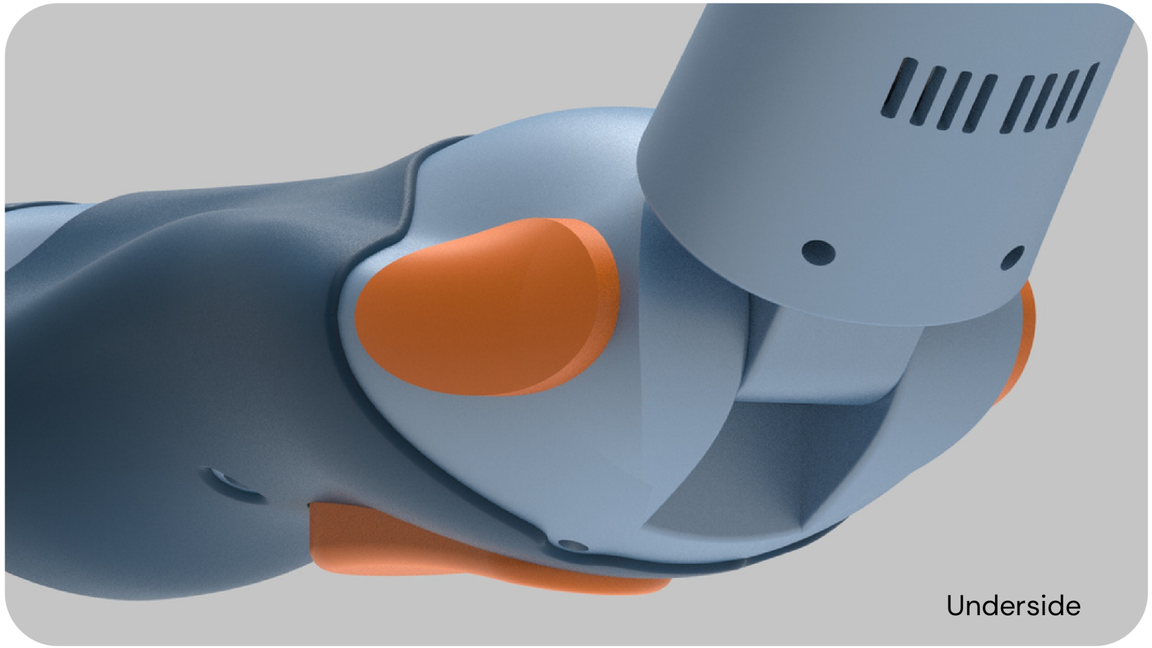
# Adjustment Features

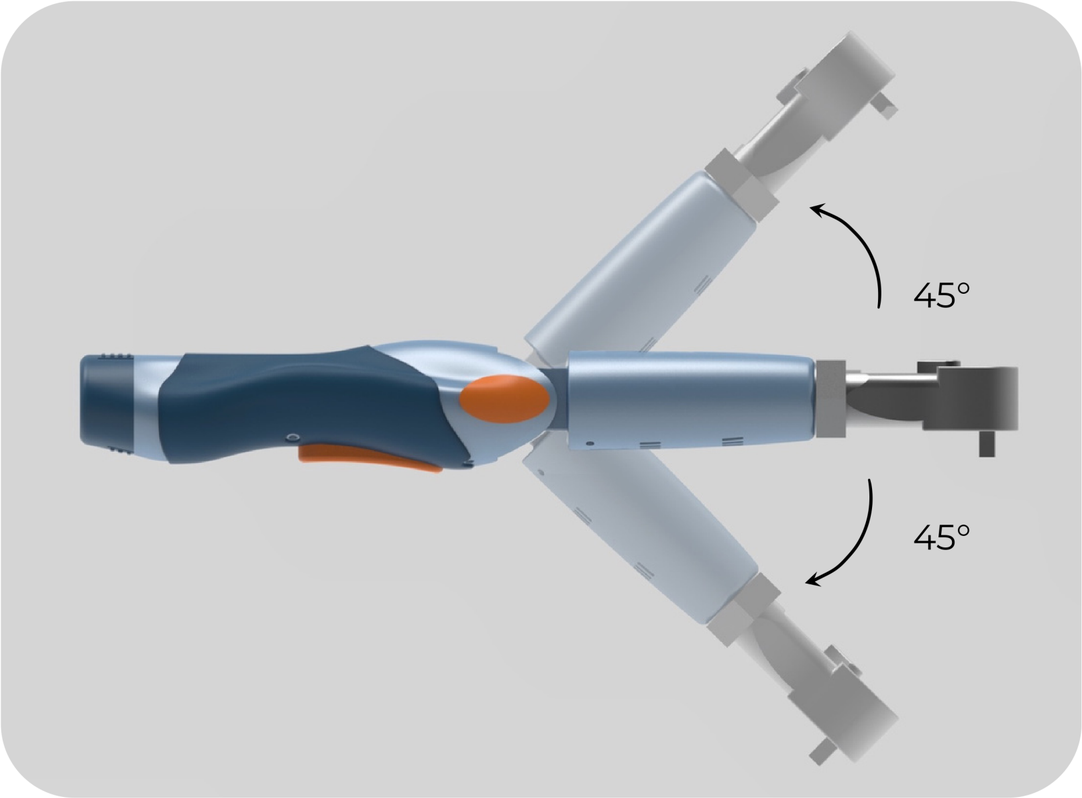
Press side buttons in to release pivot lock



Pushing in on both sides prevents accidently releasing the ratchet angle while in use

**Angle adjustment to bend the tool, not the wrists**



# Assembly Features