Upper Limb Prosthetics
Prescription Writing & Rehab Program

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Prescription Writing Issues to Consider

- **Vocational Activities**
  - Manual labor vs. office work
  - Indoors vs. outdoors
  - Moisture, electrical, impact exposure
- **Avocational Activities**
  - Homemaker, childcare
  - Indoor hobbies / crafts
  - Outdoor activities
  - Sports and fitness

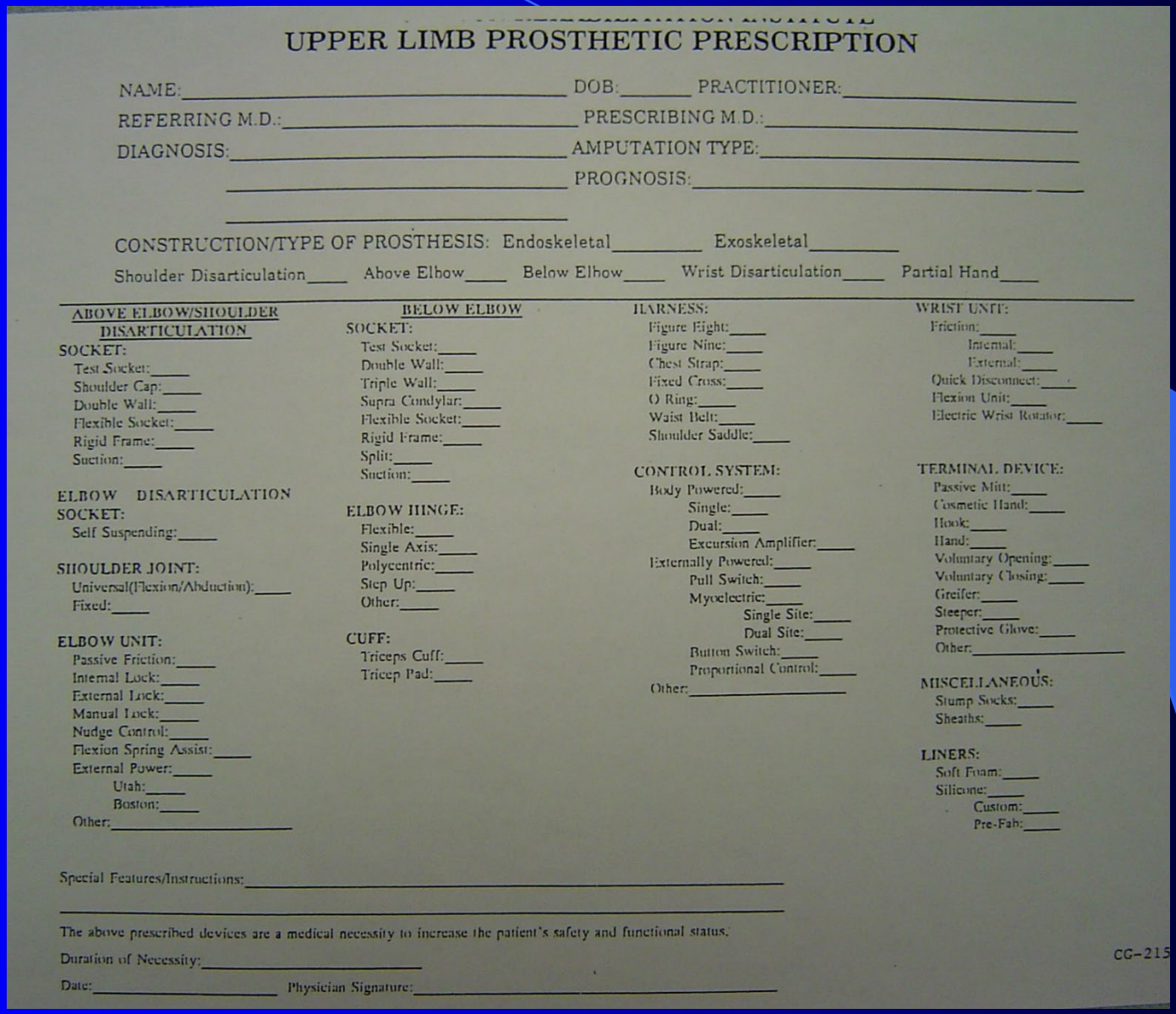
Prescription Writing Issues to Consider

- **Insurance coverage and limitations**
  - Pre-approval process
  - Annual limitations, # of devices
  - Preferred providers
- **Personal Resources**
  - Personal savings
  - Fund-raising
  - Legal settlement

Prescription Writing Issues to Consider

- **Limb Related**
  - Level of amputation
  - Associated injuries
  - Proximal muscle strength
  - Contra-lateral limb intact? Can pt. don/doff
  - Pain or tenderness to palpation
- **Skin related**
  - Adequate soft tissue coverage
  - Skin graft or scarring
  - Shape

Upper Limb Prosthetic Prescription



UPPER LIMB PROSTHETIC PRESCRIPTION

NAME:_____ DOB:_____ PRACTITIONER:_____

REFERRING M.D.:_____ PRESCRIBING M.D.:_____

DIAGNOSIS:_____ AMPUTATION TYPE:_____

_____ PROGNOSIS:_____

_____

CONSTRUCTION/TYPE OF PROSTHESIS: Endoskeletal_____ Exoskeletal_____

Shoulder Disarticulation____ Above Elbow____ Below Elbow____ Wrist Disarticulation____ Partial Hand____

ABOVE ELBOW/SHOULDER DISARTICULATION

SOCKET:
- Test Socket:____
- Shoulder Cap:____
- Double Wall:____
- Flexible Socket:____
- Rigid Frame:____
- Suction:____

ELBOW DISARTICULATION SOCKET:
- Self Suspending:____

SHOULDER JOINT:
- Universal(Flexion/Abduction):____
- Fixed:____

ELBOW UNIT:
- Passive Friction:____
- Internal Lock:____
- External Lock:____
- Manual Lock:____
- Nudge Control:____
- Flexion Spring Assist:____
- External Power:____
  - Utah:____
  - Boston:____
- Other:_____

BELOW ELBOW

SOCKET:
- Test Socket:____
- Double Wall:____
- Triple Wall:____
- Supra Condylar:____
- Flexible Socket:____
- Rigid Frame:____
- Split:____
- Suction:____

ELBOW HINGE:
- Flexible:____
- Single Axis:____
- Polycentric:____
- Step Up:____
- Other:____

CUFF:
- Triceps Cuff:____
- Tricep Pad:____

HARNESS:
- Figure Eight:____
- Figure Nine:____
- Chest Strap:____
- Fixed Cross:____
- O Ring:____
- Waist Belt:____
- Shoulder Saddle:____

CONTROL SYSTEM:
- Body Powered:____
  - Single:____
  - Dual:____
  - Excursion Amplifier:____
- Externally Powered:____
  - Pull Switch:____
  - Myoelectric:____
    - Single Site:____
    - Dual Site:____
  - Button Switch:____
  - Proportional Control:____
- Other:_____

WRIST UNIT:
- Friction:____
  - Internal:____
  - External:____
- Quick Disconnect:____
- Flexion Unit:____
- Electric Wrist Rotator:____

TERMINAL DEVICE:
- Passive Mitt:____
- Cosmetic Hand:____
- Hook:____
- Hand:____
- Voluntary Opening:____
- Voluntary Closing:____
- Greifer:____
- Steeper:____
- Protective Glove:____
- Other:_____

MISCELLANEOUS:
- Stump Socks:____
- Sheaths:____

LINERS:
- Soft Foam:____
- Silicone:____
  - Custom:____
  - Pre-Fab:____

Special Features/Instructions:_____

_____

The above prescribed devices are a medical necessity to increase the patient's safety and functional status.

Duration of Necessity:_____

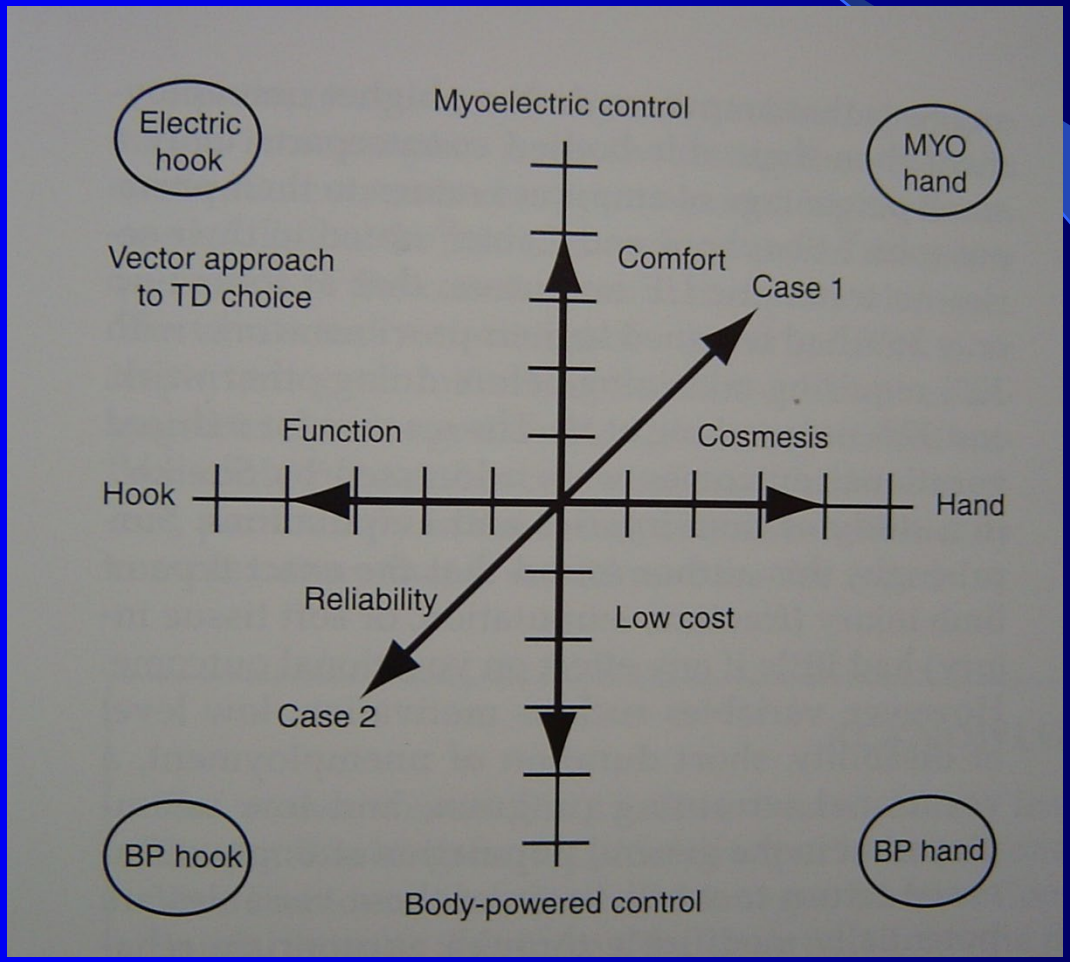
Date:_____ Physician Signature:_____

CG-215

Prosthetic Prescription General Considerations

- Functional or cosmetic prosthesis
- Cable powered or myo-electric
- Hybrid design
- Socket design and interface material
- Endo or exoskeletal design
- Shoulder, elbow, wrist joints
- Terminal devices (hook, hand, specialty)
- Protective cover/skin

Component Vector Diagram



Hook or Hand

- Hook is more durable, more functional, lighter, cheaper, but cosmetically less desirable
- Hand is more lifelike
- Specialty terminal devices may be very useful for a specific task, but look very robotic

Control Options

- Cosmetic prosthesis has only passive positioning of joints or hand
- Cable-powered prosthesis uses proximal body movements to position elbow and open hook or hand
- Myo-electric prosthesis uses surface electrodes to detect voluntary muscle activity in residual limb to activate elbow/TD
- Switch control can also be used if no muscles are available

Myo-electric Control Systems

- Myo-electric control- Advantages
  - No harness required
  - Better cosmesis
  - Less muscle strength needed

  Disadvantages:
  - More expensive
  - Heavier
  - More maintenance needed

Cable-power Control Systems

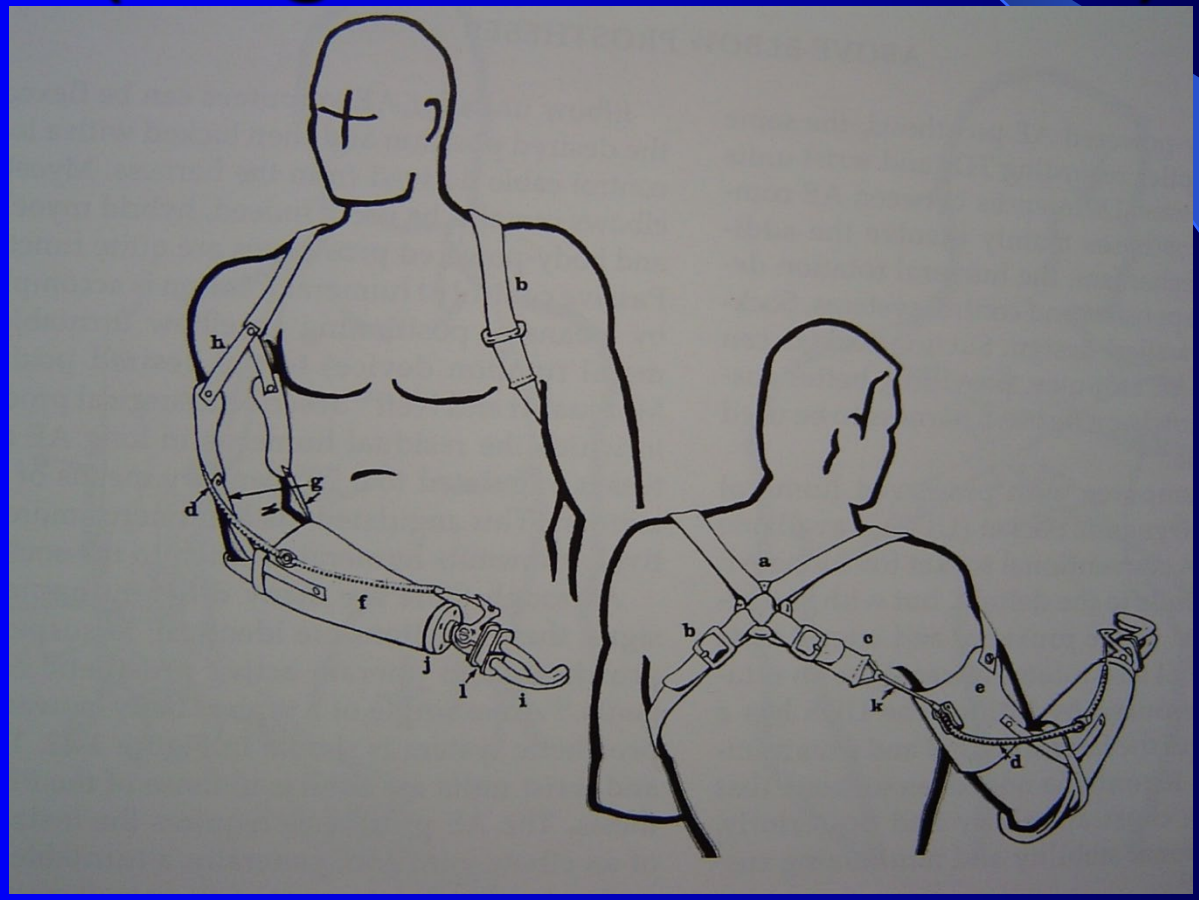
- Cable power- Advantages
  - Lighter weight
  - Less expensive
  - More durable
  - Better feedback

  Disadvantages:

  Harnessing required

  Less cosmetic

Figure-8 Harness on Trans-radial amputation (single control cable)

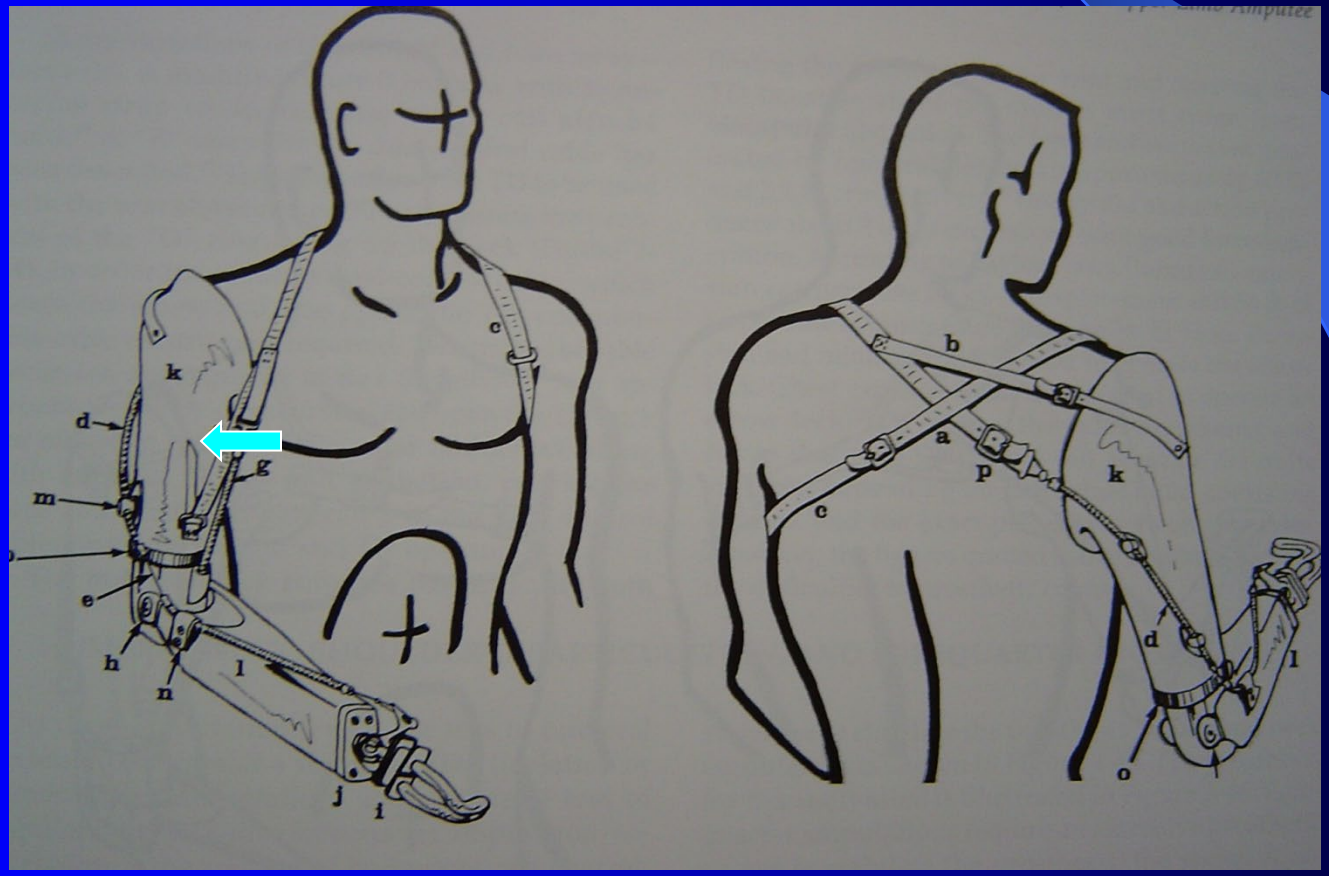


Single Control Cable Prosthesis (video)

Body Movements for Single Control Cable (below elbow and wrist)

- Forward humeral flexion
- Bi-scapular abduction (protraction)

Figure-8 Harness on Trans-humeral Prosthesis (dual control cable)



Control Features at Elbow or Above (2 cable)

- Two control cables needed
- First control cable flexes elbow
- Second control cable locks elbow
- First control cable now can open TD
- Very difficult to go back and reposition elbow once object is grasped

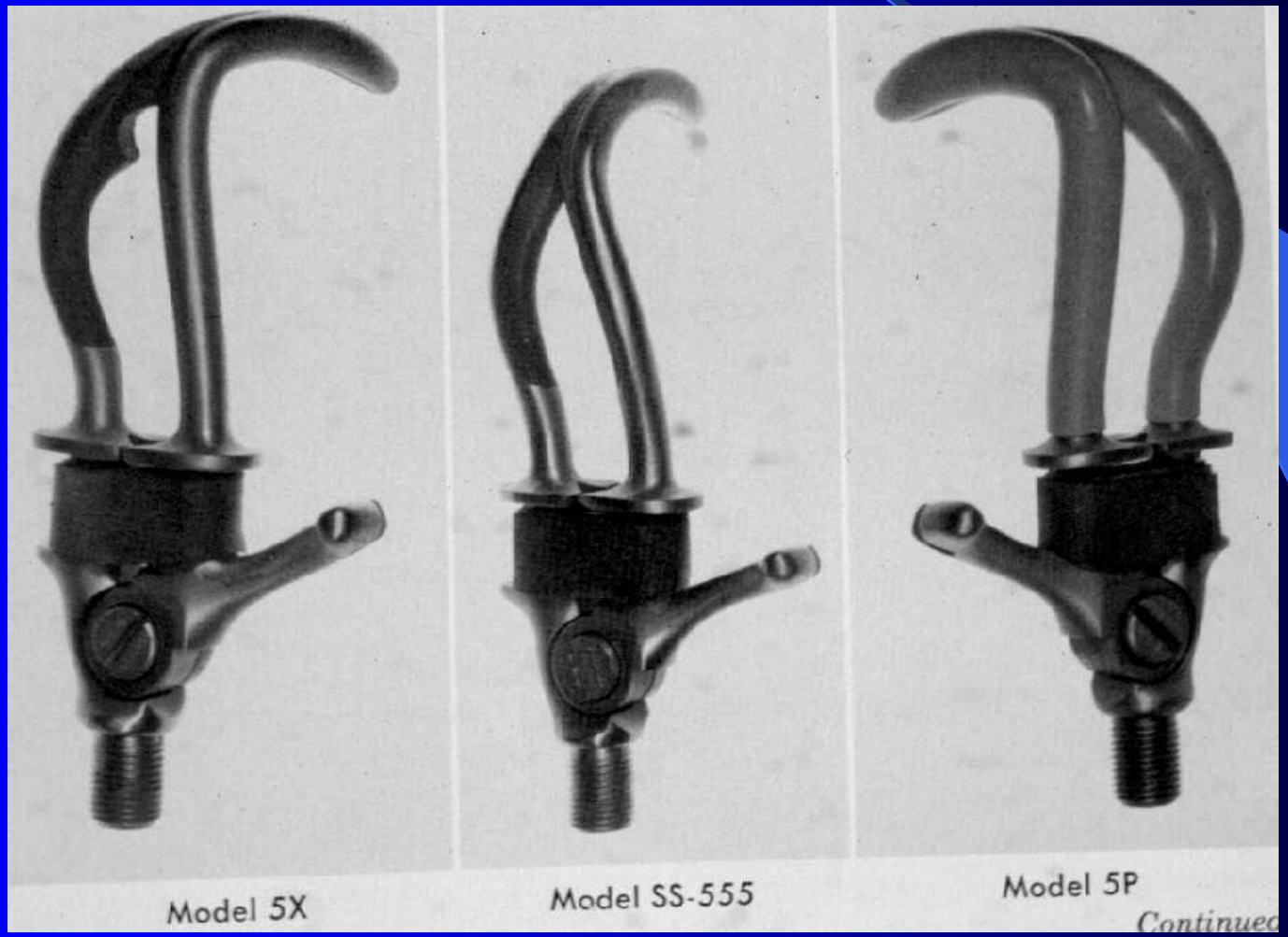
Elbow Locking Body Movements (second control cable)

- Shoulder depression
- Shoulder extension
- Shoulder abduction

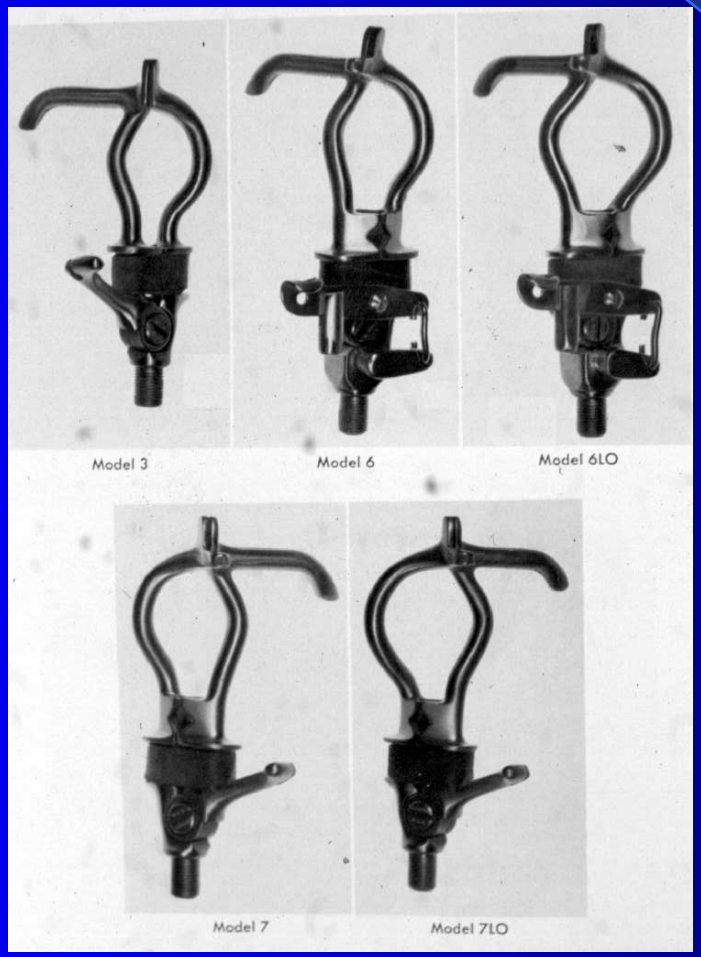
- **“DOWN, BACK, and OUT”**

Terminal Devices

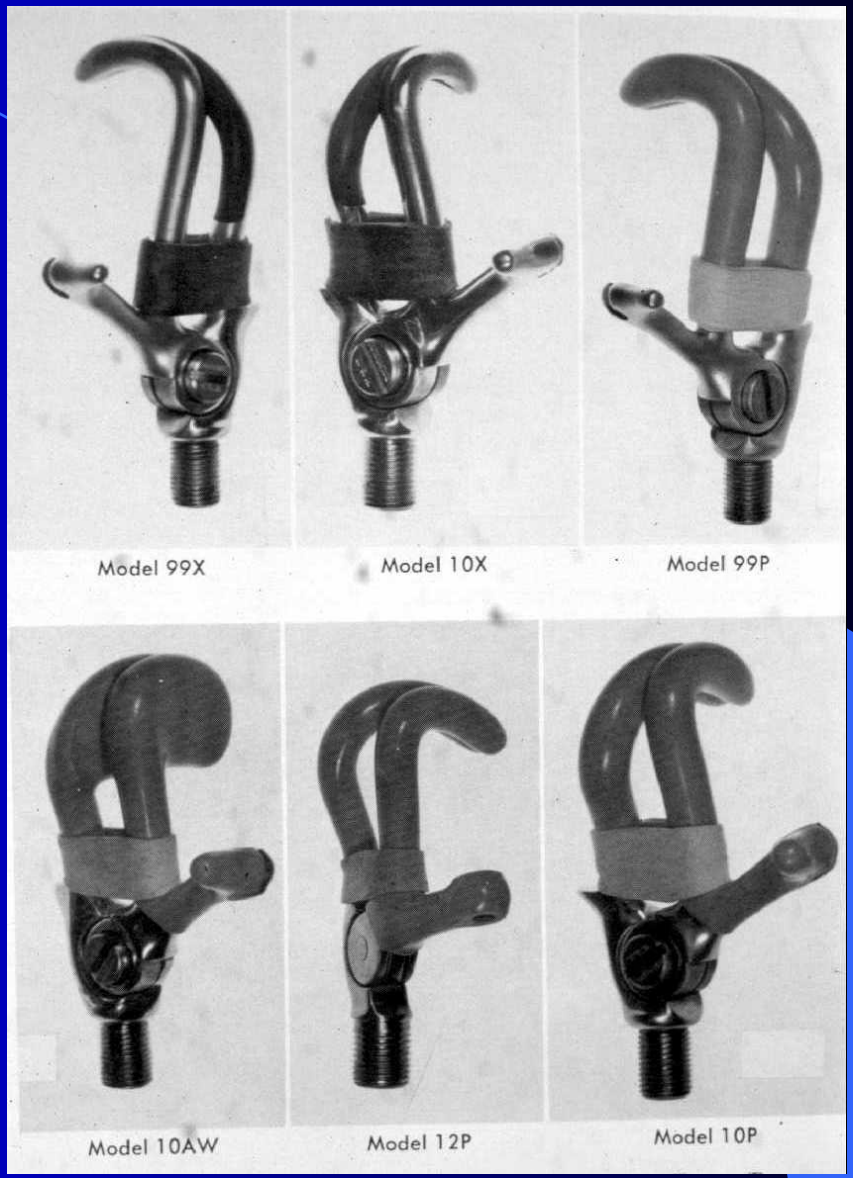
#5 Hooks – Most Common



#6-7 Workers Hooks

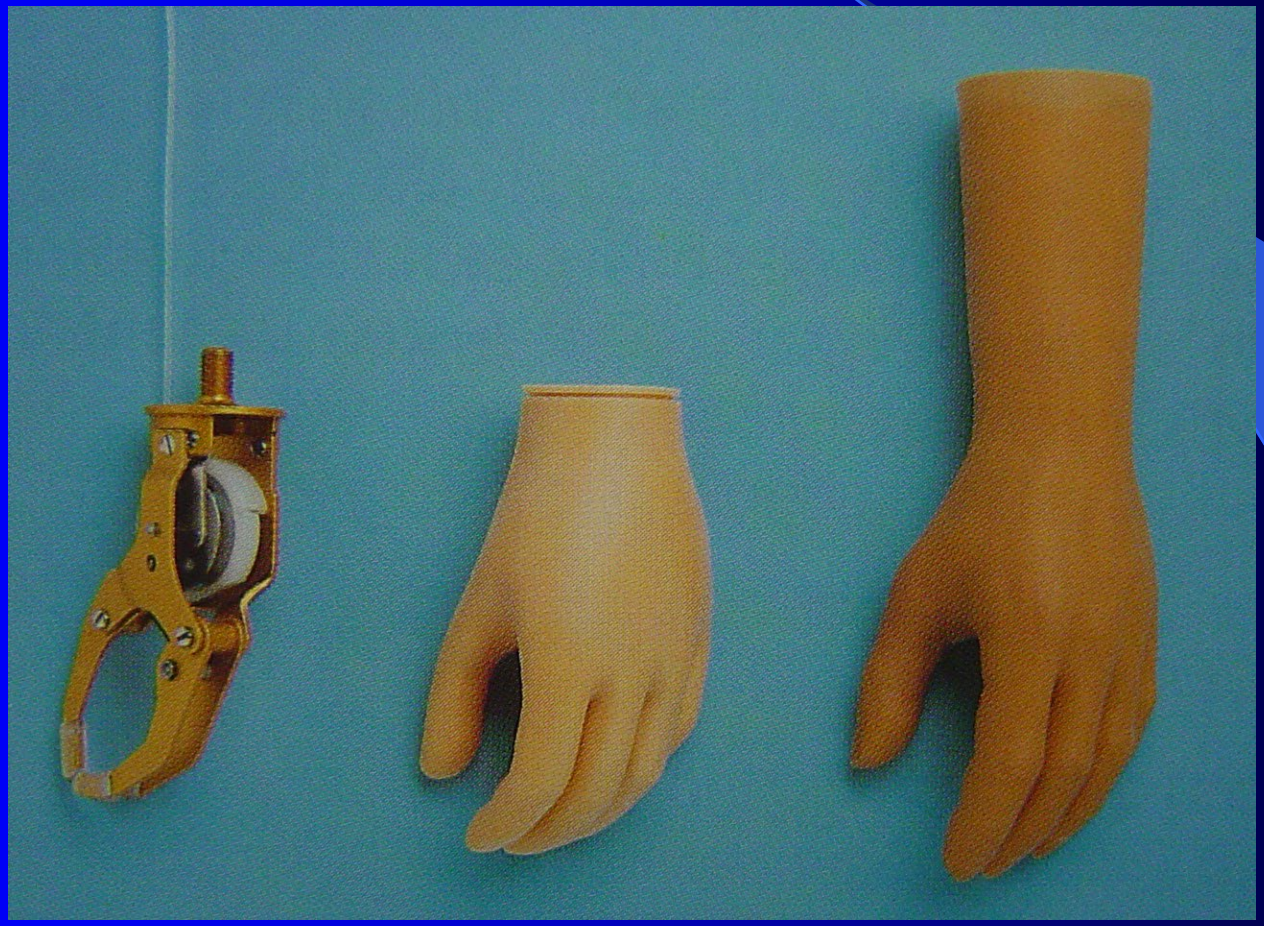


Small Adult and Child Size Hooks #9-12

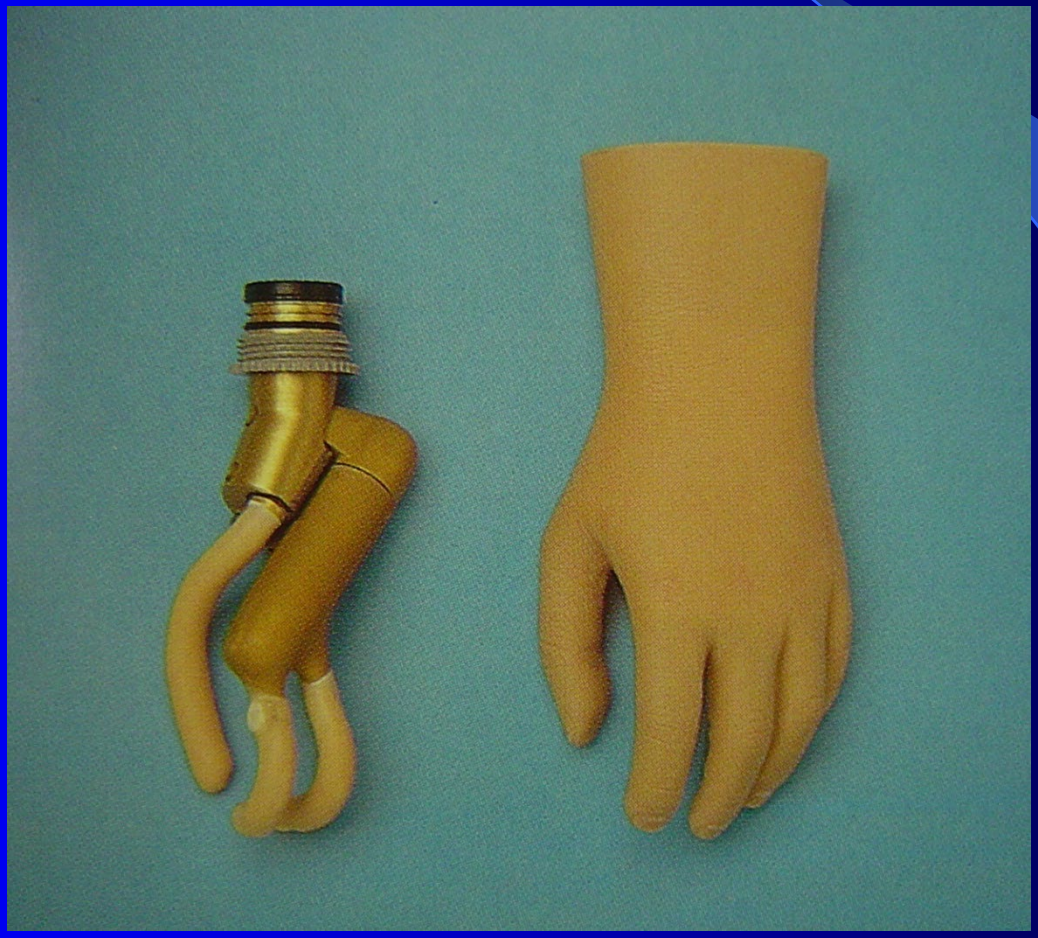


Waterproof Electric Hook

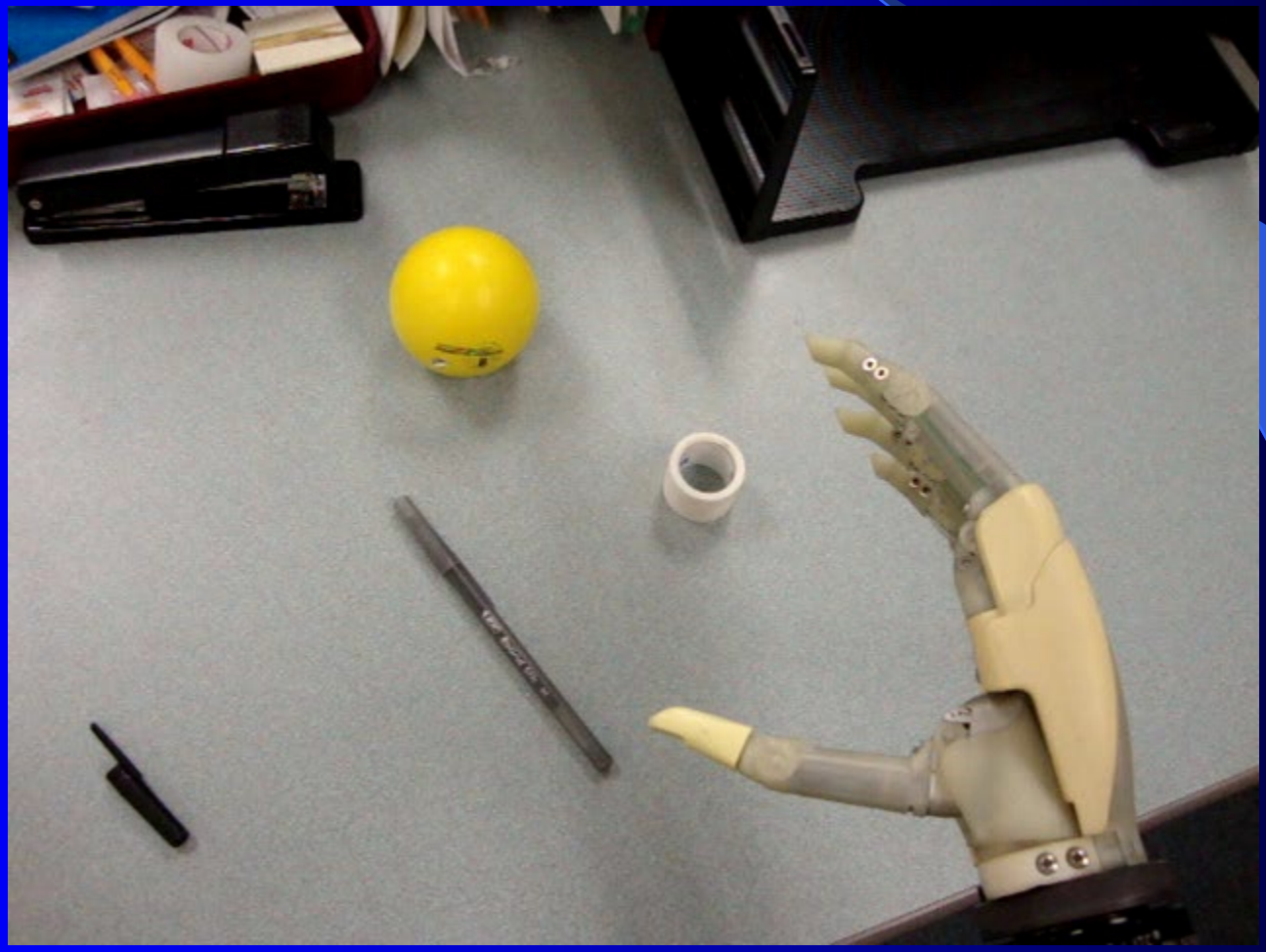
Mechanical Hand



Pediatric Electric Hand

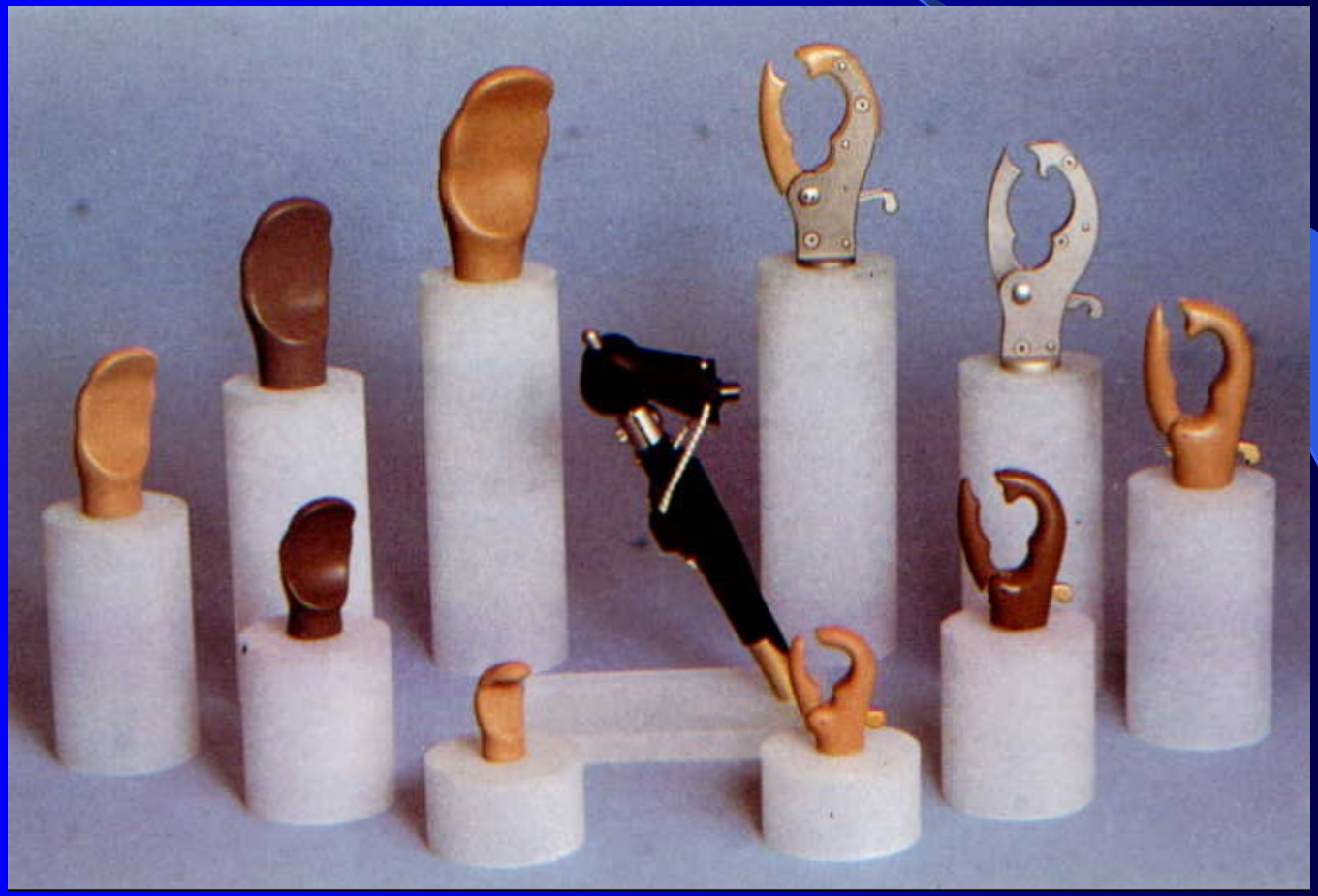


Electronic Hand with limited individual finger control



Greifer Terminal Device

Recreational Terminal Devices



Specialized Functional Terminal Devices

Wrist Disarticulation Options

- Control system- cable or myo-electric
- Socket design – soft interface?, rigid frame
- Suspension – suction, strap, harness (figure-9)
- Thin wrist unit
- Terminal device – hook, hand, robotic, specialty

Trans-radial Options

- Control system- cable or myo
- Socket design – single wall, double wall
- Suction suspension

  Wet fit into hard socket Gel liner
- Harness suspension

  Figure 9 (long) Figure 8 (short)
- Flexible elbow hinge to triceps cuff
- Wrist units

  Friction, quick disconnect, flexion

Elbow Disarticulation Options

- Control system – cable, myo, or hybrid
- Socket design-single wall, soft interface?
- Suction suspension or self-suspending
- Harness suspension – figure 8
- External elbow joints
- Forearm shell
- Wrist unit
- Terminal device

Transhumeral Options

- Control system – myo, cable, hybrid
- Socket design- interface, single/double
- Suction suspension (gel liner or wet fit)
- Harness suspension – Figure 8, shoulder saddle, cross-chest strap
- Mechanical elbow joints (internal locking)
- Turntable for internal/external rotation
- Electric elbow joints

  Utah, Liberty, Otto Bock, others
- Wrist unit and terminal device

Shoulder Disarticulation Options

- Cosmetic vs. functional prosthesis
- Socket designs (cosmetic, myo, hybrid)
- Harness designs (figure-8, cross-chest)
- Electric control options
  - Myo-electric, switches, transducers
- Shoulder joints – passive friction or locking
- Elbow joints and turntable
- Wrist units
- Terminal devices

Upper Limb Amputation Rehab Program

- **Pre-prosthetic** – limb shaping, strengthening, ROM, independent ADL's, de-sensitizing, scar/burn management, pain control
- **Prosthetic training** – don/doff device, basic skills, advanced skills
- **Psychological assessment** - limb loss and return to community activities

Pre-prosthetic Program (1)

- Limb shaping with ace-wrap or shrinker
- Wound care and healing issues
- Strengthening of residual limb muscles for possible myo-electric control (bio-feedback)
- Strengthening of proximal muscles at elbow, shoulder, contra-lateral limb
- AROM at pronation/supination, elbow, gleno-humeral, scapulo-thoracic joints

Pre-prosthetic Program (2)

- Independent toileting, dressing, bathing, feeding with adaptive devices
- Desensitizing of residual limb with tapping, rubbing, compression
- Scar management with deep friction massage
- Control of surgical pain and phantom pain
- Re-assurance that phantom sensation is normal
- Education regarding prosthetic fitting and training

When do we make the prosthesis?

- Cast for first prosthesis when wound healing is nearly complete and residual limb shape is cylindrical (2-4 weeks ideally)
- Expect to replace socket as residual limb continues to mature and shape (3-6 months)
- Most patients will get 2 prostheses in the first year, often with different control systems

Upper Limb Amputation Prosthetic Training Time

- **Below Elbow**

  outpatient PT/OT 3/wk for 4-8 weeks
- **Above Elbow**

  outpatient PT/OT 3/wk for 6-12 weeks
  may be longer for advanced skills
- **Shoulder Disartic and Bilaterals**

  therapy program depends on device

Rehab Program
Functional Task Training

- **Basic skills**
  - Don and doff prosthetic device independently
  - Operate terminal device at all levels
  - Grasp objects of various sizes
  - Assist in self-care (toileting, dressing, feeding)
- **Advanced skills**
  - Manipulate objects with prosthesis
  - Bimanual tasks (fine motor skills)
  - Return to work, driving, avocational activities

Functional Check-out 1

- Basic controls
  1. Open and close TD
  2. Pre-position TD
  3. Control wrist unit
  4. Lock/unlock elbow
  5. Rotate turntable

Functional Check-out 2

- Eating skills
  1. Handle spoon and fork
  2. Cut with knife
  3. Fill cup, drink from cup
  4. Open containers
  5. Prepare and eat sandwich
  6. Butter toast
  7. Carry tray

Functional Check-out 3

- Dressing skills (don/doff)
  1. Undergarments
  2. Shirt/blouse
  3. Trousers/skirt
  4. Socks/shoes
  5. Zipper/belt
  6. Tuck in shirt
  7. Coat

Functional Check-out 4

- Personal hygiene
  1. Hold washcloth
  2. Comb hair
  3. Brush teeth
  4. Clip nails
  5. Toileting

Functional Check-out 5

- Other activities
  1. Writing on paper
  2. Open jar, envelope, doors
  3. Dial telephone
  4. Turn switches, knobs
  5. Meal preparation
  6. Manage wallet and money

Rehab Program Special Issues

- **Driving (spinner knob, crossovers, electronic controls)**
- **Swimming (prosthesis with folding fin)**
- **Sports (special terminal devices)**
- **Cosmetic covers**

Upper Limb Amputation Lifetime Management

- **Initial check-out for fit and function**
- **Follow-up every 4 weeks during training**
- **Follow-up every 3 months first year**
- **Follow-up every 6 months lifetime**

Thank You