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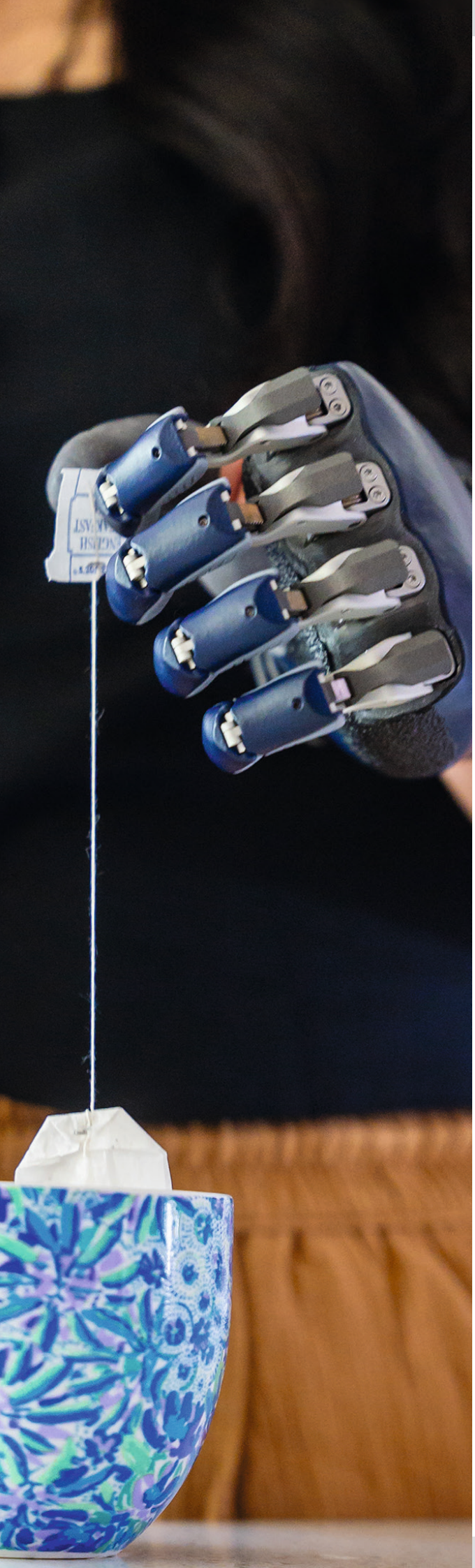
Partial Hand Absence

Whitepaper

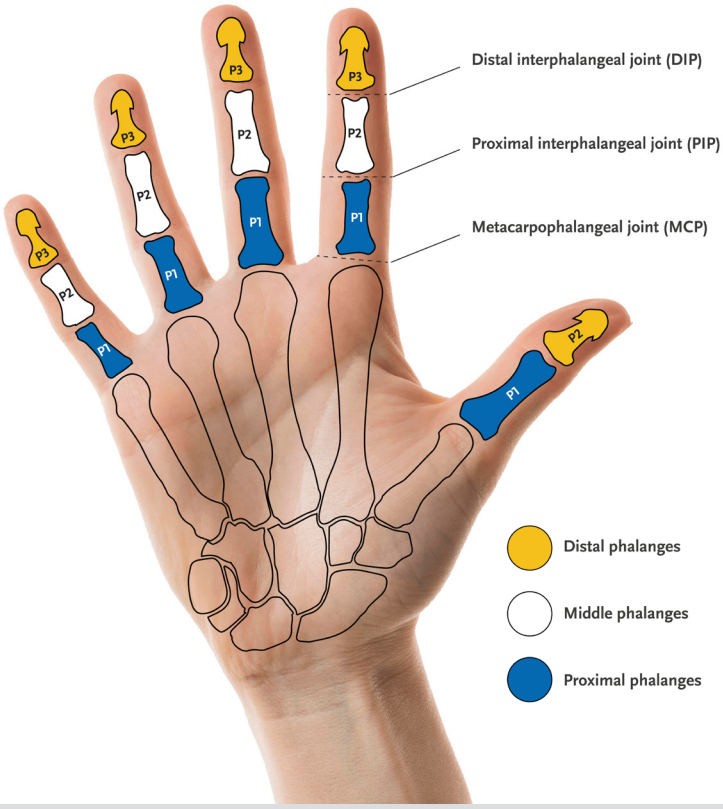


The Implications of Partial Hand Absence

Partial hand / finger amputations are the most common amputations treated by hand surgeons[1, 2]. It is estimated in the US, that 45,000 people suffer traumatic finger amputation every year, a third of which are work related[3]. In two thirds of cases the dominant limb is affected.

These amputations cause functional and cosmetic deficits because of loss of digit length, reduction in sensation, and decreased perception of body wholeness[4, 5].

Össur offers a range of prostheses for partial hand absence. Body driven devices (PIPDriver, MCPDriver and ThumbDriver) are solutions for absence distal to the MCP joint. For complete finger absence solutions include both mechanical passive ratcheting fingers (GripLock Fingers) and myoelectric controlled digits (i-Digits). Cosmetic passive options (Livingskin) are suitable for all levels of partial hand absence.



Challenges

Partial hand amputation is a life-altering injury that extends far beyond the visible loss of tissue. As the hand plays a central role in nearly every activity of daily living—grasping, dressing, cooking, typing, gesturing and communicating—partial hand amputation creates a complex constellation of clinical, functional, and emotional challenges that require coordinated, multi-disciplinary care.

Whether resulting from occupational accidents, machinery-related trauma, burns, infections such as sepsis, or malignancy, the loss of even a single phalanx can profoundly disrupt hand biomechanics, sensory feedback, and fine motor coordination[2, 6].

Level of Permanent Impairment

The Guides to the Evaluation of Permanent Impairment[5] quantify the level of absence in relation to the digit, hand, upper extremity and whole person function. The example of a single phalanx amputation of the index finger is quantified as 45% impairment of the digit, 9% impairment of the hand and a 5% whole person impairment.

Table 1 outlines other levels of partial hand absence and the associated impairment to the digit, hand, upper extremity and whole person.

	% Level of impairment			
	Digit	**Hand**	**Upper extremity**	**Whole person**
If index or middle finger:				
• DIP joint	45	9	8	5
• PIP joint	80	16	14	9
• Thumb IP joint	50	20	18	11
All 4 fingers	-	60	54	32
All 5 digits	-	100	90	54

Table 1: Permanent impairment per level of absence[5]

Psychosocial Impact

Beyond the measurable clinical and functional impairments lies a profound emotional and psychosocial impact. The hand is not only a tool but also a visible and identity-defining part of the body, often used to express feelings or to support communication[6].

People who have undergone partial hand amputation have been found to experience an increased risk of pain interference and psychological reactions in comparison with other levels of limb loss[7]. They may experience grief, altered body image, anxiety, depression, social withdrawal, and reduced self-efficacy[4, 8, 9]. These emotional consequences are often underrecognized, yet they significantly influence engagement in rehabilitation, long-term outcomes, and overall quality of life.

Compensatory Movements

People with upper limb absence need to make compensatory movements with both arms (affected and unaffected) and with their trunk in order to perform daily tasks and work-related tasks with (or without) their prosthesis[10].
These changes often lead to overuse injuries including, but not limited to;

- Muscle Imbalances: The functional impairment of the affected side can lead to increased use of the contra-lateral hand and arm, resulting in weakness on the affected side and overuse or fatigue of the opposite side[11, 12].
- Musculoskeletal Complaints: Overuse or increased physical load on the affected or unaffected arm, neck, trunk, and back. Often resulting in long-term pain or discomfort[7, 12].

Therefore, people with partial hand absence should be supported by being offered appropriate prosthetic options, education, and rehabilitation to reduce the level of detriment and ensure quality of life.

Prosthetic Solution

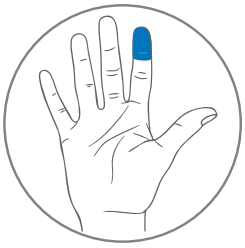
Partial hand amputation can present in very unique ways in relation to the level of absence, number of digits affected, range of motion and strength within the remaining fingers. If a prosthesis is a realistic possibility, it is important that surgeons are aware of the technical specifications and requirements for these devices in order to set the patient up for success[13].

The younger average age of individuals with upper limb amputation[1], compared to the lower limb amputee population, can be an advantage for their rehabilitation, as they are often in good physical health prior to the amputation and there is frequently good residual limb healing.
The overall aim is to promote independence and psychological well-being. This should be approached with a tailored rehabilitation plan with consideration of the patient's unique circumstances including physical, function, emotional, lifestyle and occupational needs[2, 6, 12, 14].

The patient should be presented with the prosthetic options available for them based on their specific needs. These options include;

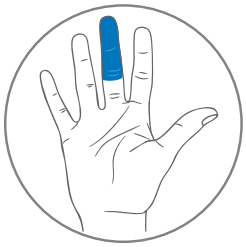
- Body powered prostheses
- Mechanical ratcheting prostheses
- Externally powered prostheses (myoelectric)
- Cosmetic prostheses
- Activity specific prostheses
- No prosthesis

Össur offers a range of solutions for the variety of presentations of partial hand absence.



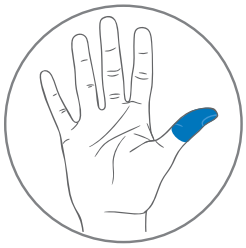
Absence at middle or distal finger phalanx

The **PIPDriver** restores finger length and is designed to securely fit the individual user's unique anatomy. Motion of the PIPDriver is driven by the users intact PIP joint, providing active flexion and extension.



Absence at the proximal finger phalanx

The **MCPDriver** restores the length of the finger and has active flexion and extension driven by the motion of the user's intact MCP joint. Additionally, side to side motion of the prosthesis is achieved by tracking the residual finger motion.



Partial thumb absence through proximal phalanx

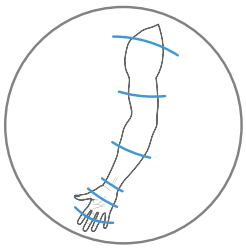
The **ThumbDriver** primarily tracks the CMC joint motion to provide thumb rotation thus achieving a range of grasp functions such as pinch and lateral grips. Prosthesis IP joint flexion and extension is driven by the user's intact MCP joint.

Complete finger absence

The **GripLock Finger** is designed for absence of the fingers 2-5, proximal to the MCP joint and distal to the wrist. It is mechanical passive ratcheting finger solution, each digit is manually positioned by the user using their sound hand or by pushing against an object. The digit locks in position providing a stable digit to grasp against with the user's intact thumb (or an appropriate thumb prosthesis).

Complete finger or thumb absence

i-Digits is designed for absence of the fingers or thumb proximal to the MCP joint and distal to the wrist. It is a multi-articulating powered prosthesis where digit motion is controlled by a myoelectric signal generated by contraction of the user's muscle. 1-5 digits can be fitted allowing it to function in conjunction with any remaining intact digits.



All levels of partial hand absence

In addition to the prosthetic solutions for each specific level of absence, Livingskin passive cosmetic prosthesis are suitable for all levels. They provide a cosmetic solution, while also offering passive functions such as pushing, pulling and supporting.

Prosthetic Outcomes

The ultimate requirement of a prosthesis is to meet the needs of the individual prosthesis user. Prosthesis users want devices which provide more functionality for activities of daily living and improve gripping and lifting strength, while still being able "to do the little things"[15].

Össur's mechanical body driven prostheses (PIPDriver, MCPDriver and ThumbDriver) all encourage bilateral hand use and provide grip stability within functional daily tasks, while protecting the amputation site from impact and abrasion. They have the potential (dependent on the exact physical presentation) to offer multiple pinches and grasps, such as power, tripod, pinch and lateral grips.

GripLock Finger encourages bilateral hand use and provides grip stability within functional daily tasks.

i-Digits can restore hand function[16, 17] and may also provide a reduction in compensatory movements and the resulting overuse injuries[16].

Regular use of a prosthesis is associated with improvements in phantom limb pain, residual limb pain, and psychological well-being[18, 19]. Many patients report significant decreases in pain in the wrist, elbow, and shoulder after being fitted with the prosthesis because they are no longer required to make compensatory motions to grasp objects[2].

Improved function and independence are closely connected to psychosocial wellbeing in relation to factors such as body image, confidence, social participation and acceptance[6, 14].

Ready to learn more?

Discover how our prosthetic solutions can support better outcomes for prosthesis users.
Scan the QR code to explore our full product portfolio and learn more on our website.

Conclusion

It is important to understand the implications of partial hand absence, as it is so commonly underestimated in regard to the functional impact of loss and the social and emotional considerations. The rehabilitation plan should include a multi-disciplinary care with the patient's specific situation and needs at the core.

Prosthetic provision is a solution for partial hand amputation. Provision should be aligned to the patients specific physical, function and psychological needs, with the aim of improving the individual's ability to live an independent and fulfilling life.

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