Partial Hand prosthetic solutions, an MDT approach for a forgotten cohort

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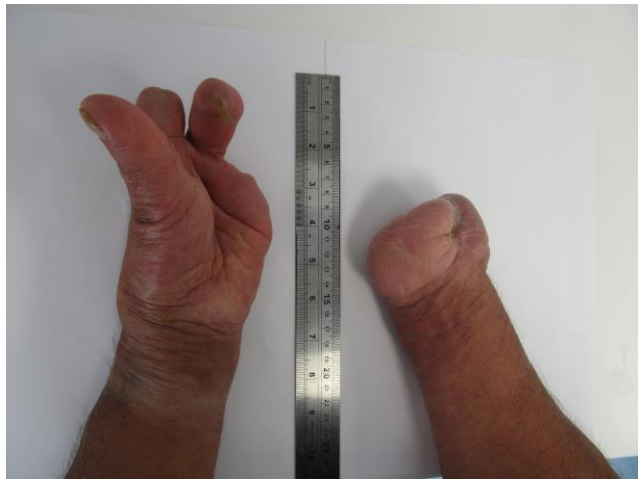
Partial Hand Amputations

- Damage where part of the hand remains!
- Umbrella term including partial or complete loss of digits
- Huge variation in presentation and functional deficit
- Big impact on social confidence
- Often poor prosthetic rehab provision



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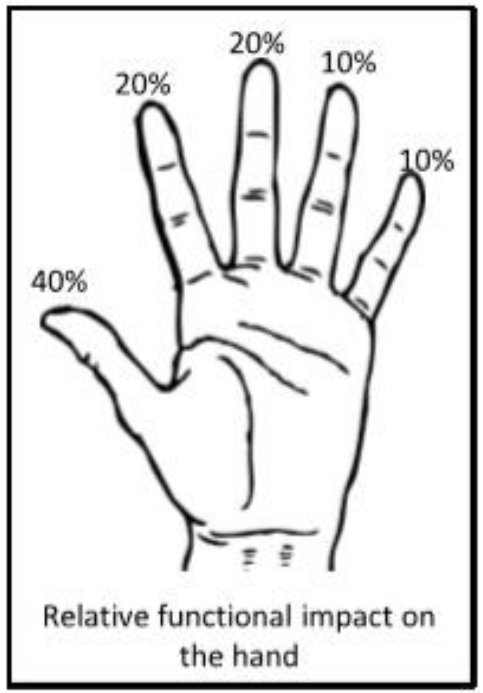
Partial Hand Amputees

- Vast majority result from trauma
  - Workplace accidents
  - Occasionally sepsis/necrosis
- Demographic:
  - Working people
  - Manual labourers, factory workers, machine operatives
- PH amputations greatly outnumber other levels of upper limb amputation

Functional loss

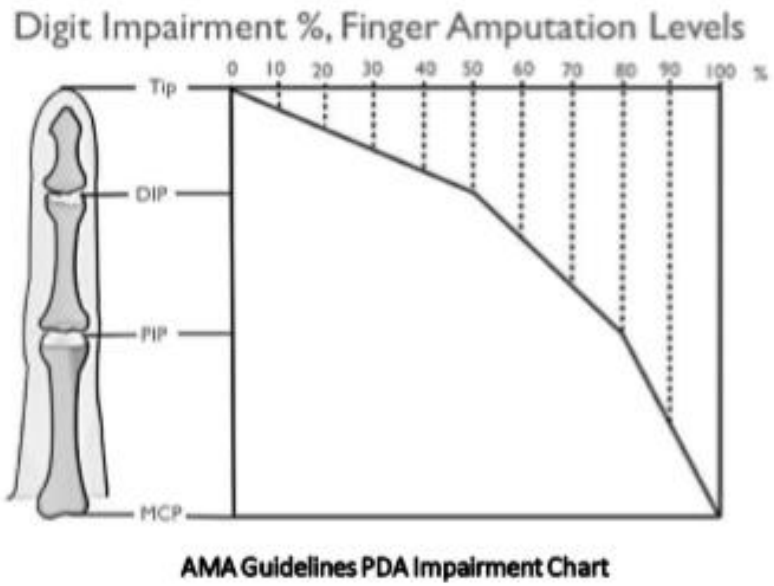
- Can *seem* disproportionate to level of amputation
- Over 50% of PH amputees are unable to return to their previous vocation
- AMA guidelines used to calculate functional loss



Relative functional impact on the hand

Example:

40% thumb impairment = 16% hand impairment → 16% hand impairment = 14% upper extremity impairment → 14% upper extremity impairment = 8% whole person impairment



AMA Guidelines PDA Impairment Chart

Table 16-1 Conversion of Impairment of the Digits to Impairment of the Hand*

% Impairment of		% Impairment of		% Impairment of	
Thumb	Hand	Index or Middle Finger	Hand	Ring or Little Finger	Hand
0 - 1 =	0	0 - 2 =	0	0 - 4 =	0
2 - 3 =	1	3 - 7 =	1	5 - 14 =	1
4 - 6 =	2	8 - 12 =	2	15 - 24 =	2
7 - 8 =	3	13 - 17 =	3	25 - 34 =	3
9 - 11 =	4	18 - 22 =	4	35 - 44 =	4
12 - 13 =	5	23 - 27 =	5	45 - 54 =	5
14 - 16 =	6	28 - 32 =	6	55 - 64 =	6
17 - 18 =	7	33 - 37 =	7	65 - 74 =	7
19 - 21 =	8	38 - 42 =	8	75 - 84 =	8
22 - 23 =	9	43 - 47 =	9	85 - 94 =	9
24 - 26 =	10	48 - 52 =	10	95 -100 =	10
27 - 28 =	11	53 - 57 =	11		
29 - 31 =	12	58 - 62 =	12		
32 - 33 =	13	63 - 67 =	13		
34 - 36 =	14	68 - 72 =	14		
37 - 38 =	15	73 - 77 =	15		
39 - 41 =	16	78 - 82 =	16		
42 - 43 =	17	83 - 87 =	17		
44 - 46 =	18	88 - 92 =	18		
47 - 48 =	19	93 - 97 =	19		
49 - 51 =	20	98 -100 =	20		
52 - 53 =	21				
54 - 56 =	22				
57 - 58 =	23				
59 - 61 =	24				
62 - 63 =	25				
64 - 66 =	26				
67 - 68 =	27				
69 - 71 =	28				
72 - 73 =	29				
74 - 76 =	30				
77 - 78 =	31				
79 - 81 =	32				
82 - 83 =	33				
84 - 86 =	34				
87 - 88 =	35				
89 - 91 =	36				
92 - 93 =	37				
94 - 96 =	38				
97 - 98 =	39				
99 -100 =	40				

Table 16-2 Conversion of Impairment of the Hand to Impairment of the Upper Extremity*

% Impairment of Hand	Upper Extremity	% Impairment of Hand	Upper Extremity	% Impairment of Hand	Upper Extremity	% Impairment of Hand	Upper Extremity	% Impairment of Hand	Upper Extremity	% Impairment of Hand	Upper Extremity
0 =	0	18 =	16	36 =	32	54 =	49	72 =	65	90 =	81
1 =	1	19 =	17	37 =	33			73 =	66	91 =	82
2 =	2	20 =	18	38 =	34	55 =	50	74 =	67	92 =	83
3 =	3			39 =	35	56 =	50			93 =	84
4 =	4	21 =	19			57 =	51	75 =	68	94 =	85
		22 =	20	40 =	36	58 =	52	76 =	68		
5 =	5	23 =	21	41 =	37	59 =	53	77 =	69	95 =	86
6 =	5	24 =	22	42 =	38			78 =	70	96 =	86
7 =	6			43 =	39	60 =	54	79 =	71	97 =	87
8 =	7	25 =	23	44 =	40	61 =	55			98 =	88
9 =	8	26 =	23			62 =	56	80 =	72	99 =	89
		27 =	24	45 =	41	63 =	57	81 =	73	100 =	90
10 =	9	28 =	25	46 =	41	64 =	58	82 =	74		
11 =	10	29 =	26	47 =	42			83 =	75		
12 =	11			48 =	43	65 =	59	84 =	76		
13 =	12	30 =	27	49 =	44	66 =	59				
14 =	13	31 =	28			67 =	60	85 =	77		
		32 =	29	50 =	45	68 =	61	86 =	77		
15 =	14	33 =	30	51 =	46	69 =	62	87 =	78		
16 =	14	34 =	31	52 =	47			88 =	79		
17 =	15			53 =	48	70 =	63	89 =	80		
		35 =	32			71 =	64				

% Impairment of Upper Extremity	Whole Person	% Impairment of Upper Extremity	Whole Person	% Impairment of Upper Extremity	Whole Person	% Impairment of Upper Extremity	Whole Person	% Impairment of Upper Extremity	Whole Person
0 =	0	20 =	12	40 =	24	60 =	36	80 =	48
1 =	1	21 =	13	41 =	25	61 =	37	81 =	49
2 =	1	22 =	13	42 =	25	62 =	37	82 =	49
3 =	2	23 =	14	43 =	26	63 =	38	83 =	50
4 =	2	24 =	14	44 =	26	64 =	38	84 =	50
5 =	3	25 =	15	45 =	27	65 =	39	85 =	51
6 =	4	26 =	16	46 =	28	66 =	40	86 =	52
7 =	4	27 =	16	47 =	28	67 =	40	87 =	52
8 =	5	28 =	17	48 =	29	68 =	41	88 =	53
9 =	5	29 =	17	49 =	29	69 =	41	89 =	53
10 =	6	30 =	18	50 =	30	70 =	42	90 =	54
11 =	7	31 =	19	51 =	31	71 =	43	91 =	55
12 =	7	32 =	19	52 =	31	72 =	43	92 =	55
13 =	8	33 =	20	53 =	32	73 =	44	93 =	56
14 =	8	34 =	20	54 =	32	74 =	44	94 =	56
15 =	9	35 =	21	55 =	33	75 =	45	95 =	57
16 =	10	36 =	22	56 =	34	76 =	46	96 =	58
17 =	10	37 =	22	57 =	34	77 =	46	97 =	58
18 =	11	38 =	23	58 =	35	78 =	47	98 =	59
19 =	11	39 =	23	59 =	35	79 =	47	99 =	59
								100 =	60

*AMA Guides to the Evaluation of Permanent Impairment, 6th Edition

18% Whole body impairment

(2x80%)x16%x29%=18%)

25% Whole body impairment

(80%+2x100%)x(16%+20%+10%)x41%=25%

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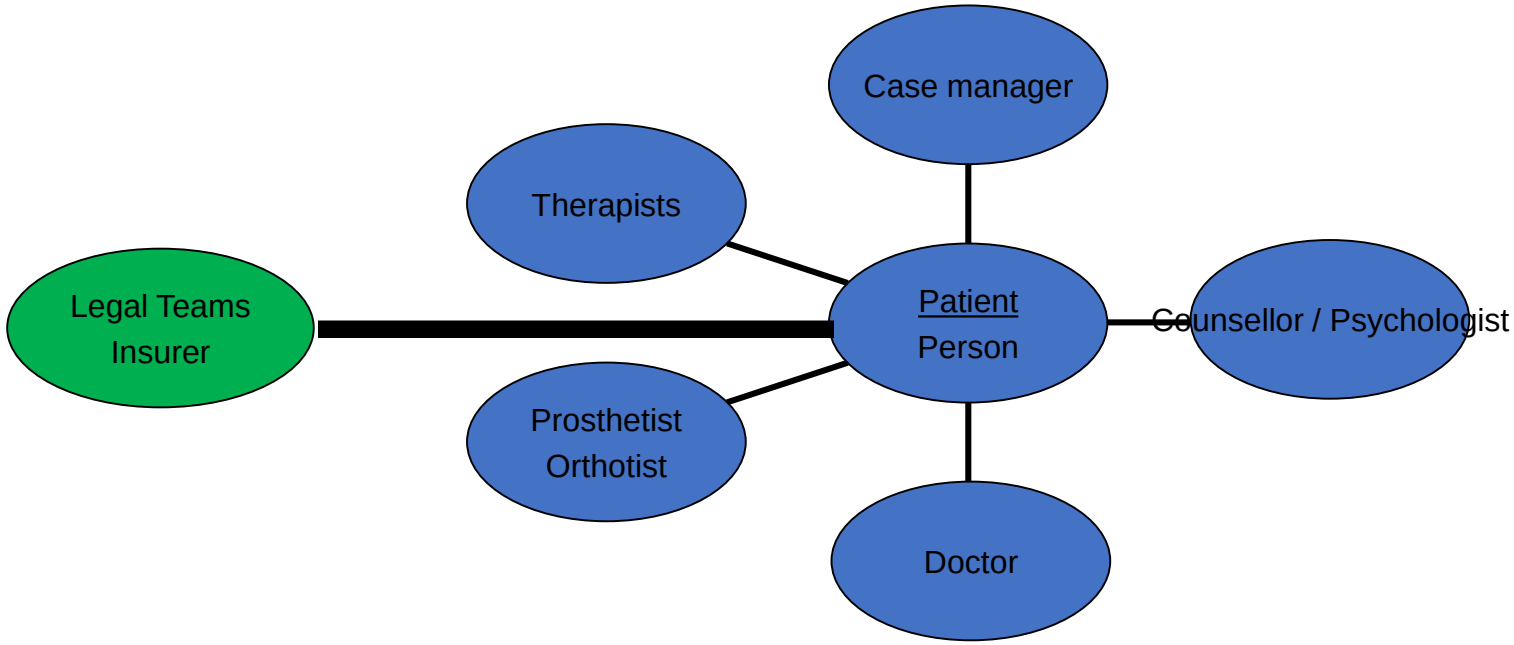
Other effects of PH amputations

- Can have significant psychological effects
  - PTSD common
  - Negative body image issues common
- Can be significantly debilitating or disabling

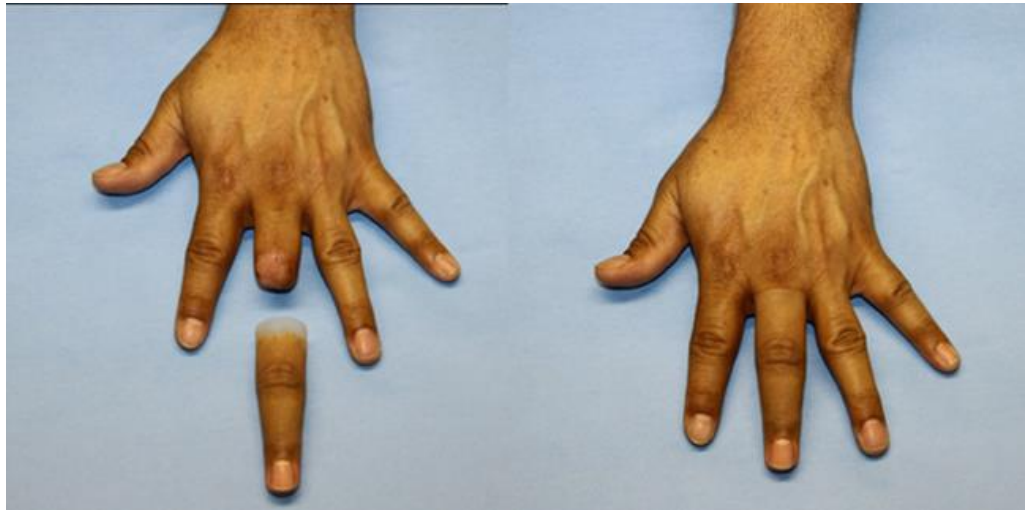
Multi Disciplinary Team Approach



Partial Hand Prosthetics

- Cosmetic
- Functional
  - Passive: may be rigid or positionable
  - Powered: either body powered or electrically powered

Cosmetic Restoration



Functional Prosthetics

- *Historically* functional options very limited
- Passive devices offer “grip augmentation”
- Powered options increasing

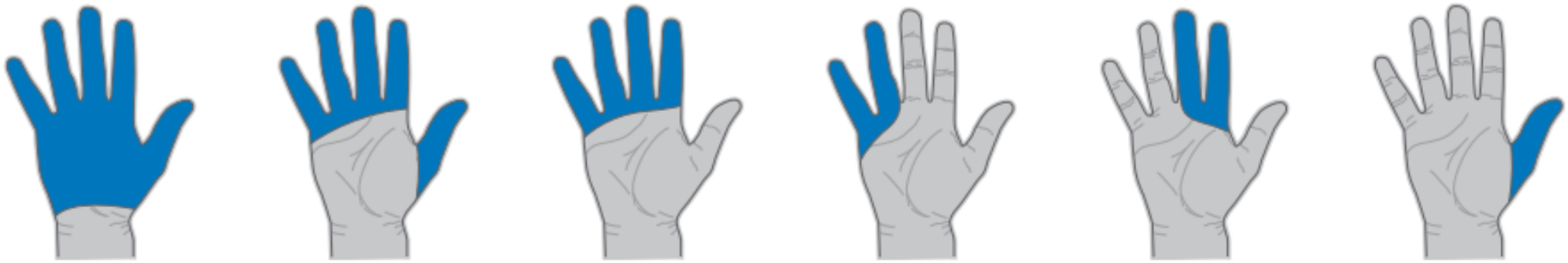
Passive device

Passive device

Active Partial Hand Prosthetics

- ‘Active’ functional options very limited
- Some electrically powered options
  - iDigits Introduced in 2009
  - Not suitable for digit amputees

i-Digits Quantum is appropriate for partial hand absence where the level of loss or deficiency is distal to the wrist and proximal of the metacarpophalangeal joint. Anywhere from one to five digits can be replaced.



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Electrically powered Prosthetics

+ Offer more function than passive devices

+ Extensive grip function

+Look cool!

- Not so good for manual working environments

Other functional PH Prosthetics

- *Historically* little progress made in this area
- Recently there has been a lot of development…

Point Digits

[Naked Prosthetics]

Costs

- Cosmetic prosthesis ~£2,000-£6,000
- NP PIP Driver ~£5,000
- NP MCP Driver ~£9,800-£28,500
- i-Limb Digits ~£30,000-£35,000

(Not incl. assessment, no extended warranty)

To conclude

- A partial hand amputation is a substantial disability
- Historically this cohort is badly served
- Improved functional solutions exist
- Refer!

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