

Aulie knee & suction socket for swimming prostheses

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Conventional swimming prostheses

- Iceross liner, pin lock suspension
- Otto Bock 3K9 knee
- Exoskeletal laminate socket & lower leg
- (LA ankle)
- SACH foot



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AulieDevices.com

- Knee since 1989
- Many other designs, eg Endolite TT pylon, OB 3R75 knee, Seattle Ankle
- Sell 300 knees/year: 20 in total to UK
- Free servicing: 1% pa of leaking dampers
- Alan Aulie [aaulie@cointet.com]

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Aulie 802 knee

- Designed for water & dirty activities
- Nylon chassis 750g
- Stainless steel shafts & hydraulic swing phase control
- Pyramid attachment, 30mm shin tube
- 100kg weight limit
- CE marked
- Nothing in PubMed

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Our users

- 3 men, 2 women, age 20-34
- Trauma (4), neoplasia (1), 2-14 years ago
- Full time active walkers
- Swim: 1 other sports
- Healthy stumps, recommended length

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Components

- Walking limbs
 - 2 suction, 3 pin lock sockets
 - Ultimate (2), Sensor, IP, 3R60 knees
 - Variflex (2), Dynamic Plus, Elation, +?
- New water limbs
 - Same socket design
 - OWW SACH feet, 1 Seattle Lightfoot (no LA ankle)
 - Mean 6.3 months use

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Survey

- Very positive feedback in clinic
- Questionnaire sent to all 5 (a week ago)
 - 2 returned so far
- Maintenance/ repairs:
 - Nil

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Socket comfort ?

- OB 2,6
- Aulie 8, 8
- “Suction socket is far better—and more water-tight”

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Weight of leg

• OB 1,3

“Very heavy, difficult to actually swim”

• Aulie 10,10

“Lighter than my walking leg (which is a great bonus when taking it on holiday)”

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Ease of walking

• OB 1,2

“Horrible; fixed knee caused back ache”

• Aulie 8,9

“Position of knee is perfect. I never keep the knee locked. Can walk as far as with my main leg, though not, perhaps, as easily, mainly due to foot/ankle”

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Ease of water activity

OB 2,6

“Iceross liner was prone to take on water, esp. problematic when trying to walk thereafter. Hinged ankle better for purpose.”

“Difficult to kick due to fixed knee”

Aulie 8, 9

“No problems with water leakage. Deduct a point only for having fixed ankle.”

“Able to swim properly”

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Security when walking

OB 1, 7

“Treacherous with knee free, almost impossible with knee locked. Prone to drop off after prolonged use in water”

“Awkward, but never gave way”

Aulie 8, 9

“When used to unbalanced knee, it is fine”

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Security when standing

OB 7, 10 Aulie 8,10

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Reliability of leg

OB 2 Aulie 8, 9

“..knee locking mechanism
and iceross pin lock
frequently went wrong.”

“Broke on holiday..pin would
not go into socket”

“..foot was rotated in aircraft
hold..”

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Appearance of leg

OB 6, 6

“Position of knee when sitting was ludicrous.”

Aulie

8, 10

“Functional, but foot larger than usual.”

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Does knee protrude when sitting?

OB 1, 2

“Yes—centre of knee was 6in too low because of iceross bolt. Sitting down therefore very uncomfortable.”

Aulie

9, 10

“No—better than my main leg”

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Distance you can comfortably walk on ground ?

OB	1, 2	Aulie	8, 9
“Could not walk <i>comfortably</i> at all”		“Can wear leg all day and walk about freely: foot & ankle prevent it being comfortable enough to walk along way”	
“Wearing in 3 hours by pool was enough; only walked in & out of hotel”			

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Ease of getting in/out of pool

OB	4, 4	Aulie	8, 10
“No problem getting in. Getting out difficult because of weight of lead and of water with which it filled. Had to stand on poolside for several minutes while water drained out. Extremely difficult getting into and out of sea.”		“No waiting for water to fill or drain”	

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Use as spare walking leg ?

OB 1,1

“Impossible to use for that due to difficulties of walking and sitting.”

“Would never have been possible”

Aulie 3, 9

“For emergencies, short-term, but not for an extended period. It isn’t an alternative walking knee, at least for someone used to an Ultimate.”

“Foot/ankle would make it too uncomfortable”

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Relative costs

Iceross liner & shuttle lock	£400	Suction socket valve	
OB knee	£250	Aulie knee	£882
LA ankle	£360		
SACH foot	£45	SACH foot	£45
<u>Total</u>	<u>£1055</u>	<u>Total</u>	<u>£927</u>
Hours	35	Hours	7

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Benefits to service

- Easier alignment & manufacture
- Quicker to make (7 vs 35 hours)
- Quicker (possible) to adjust
- Potential to use as spare walking limb

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Benefits to user

- Lighter endoskeletal design
- Easier to walk....limited by foot
- Adjustable socket, alignment

- Suction more reliable suspension in water
- Knee at correct level

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Foot/ankle limits walking

- Ideally
 - Similar spring to walking leg
 - Water resistant components
 - Modest volume of silicone to fill foot shell
 - Split toe
- Any suggestions?

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