Are plasma citrulline levels a reliable marker of residual intestinal length and enterocyte mass?

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PLASMA CITRULLINE LEVELS IN PATIENTS WITH SHORT BOWEL SYNDROME

P073-W

Background

In recent years, the amino acid citrulline has gained scientific attention due to its unique metabolism, prompting suggestions that plasma citrulline may be a reliable marker of residual intestinal function and enterocyte mass[1]. Circulating citrulline are dependent on mainly de novo synthesis from the small bowel mucosal enterocytes, and no other cells are believed to produce significant amounts of citrulline. The aim of this study was to measure citrulline concentration in healthy controls and in four anatomical distinct groups of patients with short bowel syndrome (SBS).

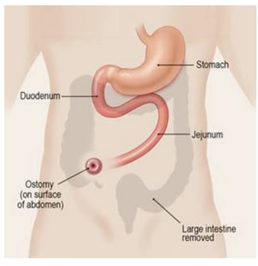
Methods

31 patients included.

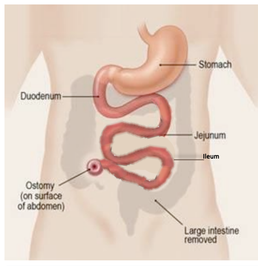
Blood samples were obtained after an overnight oral fast. For patients with intestinal failure, usual parenteral nutritional prescription was adjusted the night before study day, and nutrition was replaced with an isovolumic saline infusion.

Plasma citrulline levels were measured by liquid chromatography-tandem mass spectrometry **(reference value in healthy control subjects: 30.5 µmol/L ± 8.8).**

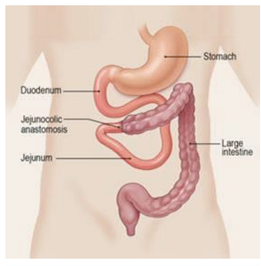
Kruskal-Wallis test used for comparison of anatomical groups. Spearman correlation coefficients were used to compare small bowel lengths to citrulline levels.



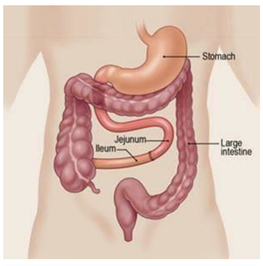
GROUP 1A
End jejunostomy



GROUP 1B
End ileostomy
Preserved jejunum

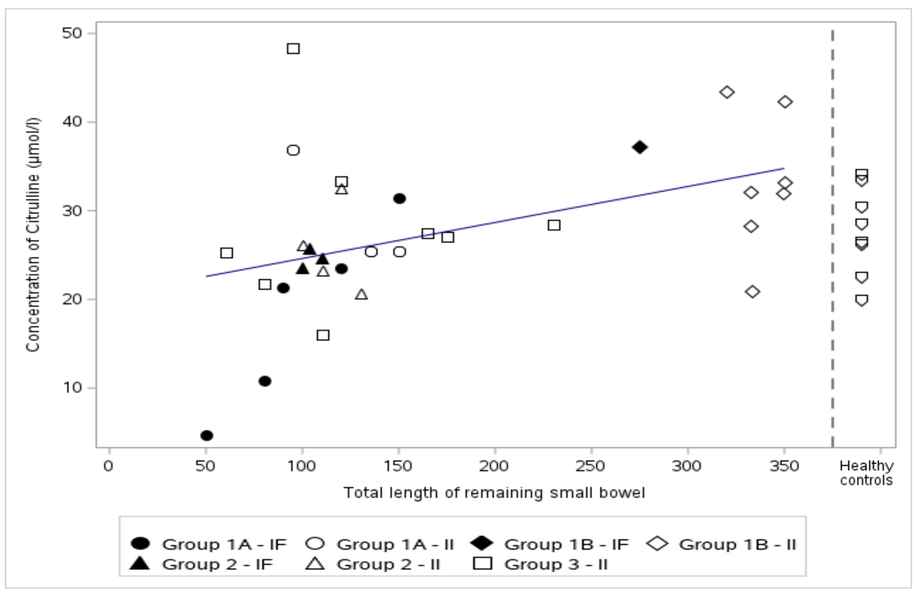


GROUP 2
Jejuno-colonic-anatomosis



GROUP 3
Jejuno-ileal-anastomosis and preserved colon

Results



Plasma concentrations of Citrulline (µmol/l) in patients with short bowel syndrome and healthy controls.

		Group 1A N=8	1B N=8	2 N=7	3 N=8	Healthy controls N=8	p
Gender	(Female %)	4 (50 %)	7 (88 %)	3 (43 %)	4 (50 %)	4 (50 %)	
Age		56.8 (32.1-72.9)	53.7 (27.3-78.0)	56.1 (43.6-74.2)	63.4 (34.9-75.0)	40.4 (32.0-74.9)	*0.11*
BMI	(kg/m²)	23.1 (17.2-27.2)	24.5 (20.5-29.0)	22.8 (21.2-28.6)	22.1 (21.6-32.3)	23.2 (18.3-25.9)	*0.34*
II / IF		3 / 5	7 / 1	4 / 3	8 / 0	-	
Small bowel length	(cm)	108 (50-150)	333 (275-350)	110 (100-130)	115 (60-230)	-	
Colon length	(%)	-	-	71 (64-86)	100 (100-100)	-	
Causes of SBS IBD / SC / thrombosis / other		7 / 0 / 0 / 1	7 / 1 / 0 / 0	6 / 1 / 0 / 0	1 / 2 / 5 / 0	-	
Years from last surgery		9.6 (6.8-20.0)	14.3 (5.2-31.1)	8.8 (0.5-17.6)	9.4 (1.3-31.8)	-	
Citrulline	(µmol/L)	24.5 (4.7 – 36.9)	32.7 (21.0 - 43.4)	24.6 (20.7 - 32.5)	27.3 (16.1 - 48.4)	27.6 (19.9 - 34.2)	*0.09*
Creatinine	(µmol/L)	78.0 (67.0 - 112.0)	69.5 (55.0 - 92.0)	88.0 (63.0 - 156.0)	78.5 (49.0 - 126.0)	75.5 (58.0 - 93.0)	*0.38*
eGFR	(ml/min)	83.5 (56.0 - 90.0)	88.5 (52.0 - 90.0)	81.0 (42.0 - 90.0)	79.5 (48.0 - 90.0)	90.0 (79.0 - 90.0)	*0.51*

Data presented as median (min-max). II: Intestinal insufficiency. IF: Intestinal failure. Colon length measured in cummings percentage.
IBD: Inflammatory bowel disease. SC: Surgical complication

Summary/ Highlights

No differences in plasma citrulline levels were evident across the four distinct anatomical groups of SBS patients, with all groups demonstrating citrulline concentrations comparable to healthy controls. Notably, large individual variations in citrulline levels were observed within each anatomical group. In line with previously published papers [1], it was observed that plasma citrulline levels correlate with remaining length of small bowel across the anatomical groups.

However, subgroup analyses revealed a statistically significant correlation only among patients with the shortest bowel length (Group 1A). This implies that citrulline may be a complex marker to interpret in SBS patients with ileostomies and colon-in-continuity.

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References

1 **Crenn P et al.** Postabsorptive plasma citrulline concentration is a marker of absorptive enterocyte mass and intestinal failure in humans. Gastroenterology. 2000 Dec;119(6):1496–505.

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