



Supplementary Figure 1 Forest plot showing 90-d postoperative mortality. BCAA:

Branched chain amino acid; CI: Confidence interval.

Supplementary Table 1 Full search strategy

Database	Search terms	No. of results
PubMed	<p>(BCAA* OR "Branched-chain amino acid*" OR "Branched chain amino acid*" OR "Amino Acids, Branched-Chain"[Mesh] OR Branched-chain OR "Branch chain*" OR Leucine or Valine or Isoleucine)</p> <p>AND</p> <p>(liver OR hepatic OR hepatocellular OR HCC OR "Carcinoma, Hepatocellular" [Mesh])</p> <p>AND</p> <p>(resection OR surgery OR surgical OR operation OR excision OR preoperative OR pre-operative OR perioperative OR peri-operative OR postoperative OR post-operative OR "post operative" OR curative OR hepatect* OR "Hepatectomy"[Mesh] OR segmentectom* OR lobectom* OR transplant* OR proced* OR "Liver Transplantation"[Mesh])</p>	2151
Embase	<p>(bcaa* OR 'branched-chain amino acid*' OR 'branched chain amino acid*' OR 'branched chain amino acid'/exp OR 'branched chain' OR 'branch chain' OR leucine OR valine OR isoleucine)</p> <p>AND</p> <p>(liver OR hepatic OR hepatocellular OR HCC OR 'liver cell carcinoma'/exp)</p> <p>AND</p> <p>(resection OR surgery OR surgical OR operation OR excision OR preoperative OR 'pre operative' OR perioperative OR</p>	2840

'peri operative' OR postoperative OR 'post operative' OR curative OR hepatect* OR 'hepatectomy'/exp OR segmentectom* OR lobectom* OR transplant* OR 'liver graft'/exp OR proced*)

Scopus (bcaa* OR "Branched-chain amino acid*" OR "Branched chain amino acid*" OR branched-chain OR "Branch chain*" OR leucine OR valine OR isoleucine) 2364

AND

(liver OR hepatic OR hepatocellular OR HCC)

AND

(resection OR surgery OR surgical OR operation OR excision OR postoperative OR post-operative OR "post operative" OR pre-operative)//(bcaa* OR "Branched-chain amino acid*" OR "Branched chain amino acid*" OR branched-chain OR "Branch chain*" OR leucine OR valine OR isoleucine)

AND

(liver OR hepatic OR hepatocellular OR HCC)

AND

(preoperative OR perioperative OR peri-operative OR curative OR hepatect* OR segmentectom* OR lobectom* OR transplant* OR proced*)

Cochrane
Library

-	+	#1	((bcaa* OR "Branched-chain amino acid*" OR "Branched chain amino acid*" OR branched-chain OR "Branch chain*" OR leucine OR valine OR	Limits	3875
-	+	#2	MeSH descriptor: [Amino Acids, Branched-Chain] explode all trees	MeSH	2263
-	+	#3	#1 or #2	Limits	4374
-	+	#4	(liver OR hepatic OR hepatocellular OR HCC)	Limits	75874
-	+	#5	MeSH descriptor: [Carcinoma, Hepatocellular] explode all trees	MeSH	1996
-	+	#6	#4 or #5	Limits	75874
-	+	#7	(resection OR surgery OR surgical OR operation OR excision OR postoperative OR post-operative OR "post operative" OR pre-operative OR preoperative OR perioperative OR peri-operative OR curative OR hepatect* OR segmentectom* OR lobectom* OR transplant* OR proced*)	Limits	559413
-	+	#8	MeSH descriptor: [Liver Transplantation] explode all trees	MeSH	1283
-	+	#9	MeSH descriptor: [Hepatectomy] explode all trees	MeSH	674
-	+	#10	#7 or #8 or #9	Limits	559413
-	+	#11	#3 and #6 and #10	Limits	192

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Web of Science (bcaa* OR "Branched-chain amino acid*" OR "Branched chain amino acid*" OR branched-chain OR "Branch chain*" OR leucine OR valine OR isoleucine)

AND

(liver OR hepatic OR hepatocellular OR HCC)

AND

(resection OR surgery OR surgical OR operation OR excision OR postoperative OR post-operative OR "post operative" OR pre-operative OR preoperative OR perioperative OR perioperative OR curative OR hepatect* OR segmentectom* OR lobectom* OR transplant* OR proced*)

BCAA: Branched chain amino acid; HCC: Hepatocellular carcinoma.

Supplementary Table 2 Population, intervention, comparison, outcomes and study inclusion and exclusion criteria

	Inclusion criteria	Exclusion criteria
Population	Patients diagnosed with liver cancer, and being planned for or have undergone liver surgery for treatment of liver cancer	Patients undergoing surgery for indications other than liver cancer Patients undergoing procedures such as radiofrequency ablation and transarterial chemoembolisation only
Intervention	Patients with branched chain amino acids supplementation pre-operatively or post-operatively	
Comparison	Patients in control arm with normal diet prescribed pre-operatively and post-operatively for study follow-up duration	Patients in control arm with any other form of oral nutritional supplementation pre-operatively or post-operatively
Outcomes	Perioperative (morbidity, mortality and length of stay) and oncological (recurrence and overall survival)	
Study type	Articles in English or translated to English	Mixed methods research, meta-analyses, systematic reviews, case-control studies, cross-sectional studies and descriptive

papers

High-quality longitudinal Studies published in any cohort studies or trials or language other than English, and randomized-controlled trials do not have an English translation

Supplementary Table 3 Definition of mortality outcomes in included studies

Ref.	Mortality definition	Intervention		Control		Follow-up time ¹	
		Sample size	No. of deaths	Sample size	No. of deaths	Intervention	Control
Hachiya <i>et al</i> ^[39] , 2020	Calculated from 74 4-yr survival rate survival	74	2	80	5	21.8 mo	NR
Ichikawa <i>et al</i> ^[40] , 2013	Calculated from 26 4-yr survival rate survival	26	4	30	3	39.5 mo	36.0 mo
Kobayashi <i>et al</i> ^[36] , 2019	Calculated from 26 5-yr survival rate survival	26	6	10	4	NR	NR
Meng <i>et al</i> ^[31] , 1999	Mortality at last 21 follow up	21	7	23	4	511.6 d	512.7 d
Nagasue <i>et al</i> ^[32] , 1997	Mortality at last 67 follow up	67	34	65	32	35.8 mo (17.9)	36.0 mo (17.7)
Okabayashi <i>et al</i> ^[35] , 2008	Mortality at last 40 follow up	40	9	72	13	16.3 mo	23.3 mo

¹Data is expressed as n or mean +/- SD (median, range)

Supplementary Table 4 Comparison of Aminoleban EN and livact

BCAA	Company of manufacture	Country of manufacture	City of manufacture	Dosage	Composition				
					L-Isoleucine (mg)	L-leucine (mg)	L-valine (mg)	Lipid (g)	Carbohydrate (g)
Aminoleban EN	Otsuka	Thailand	Samut Sakhon	50 g/packet	1922.5	2037	1602	3.7	31.5
Livact	Ajinomoto	Japan	Tokyo	4.15 g/packet	952	1904	1144	NIL	NIL

BCAA: Branched chain amino acid; NIL: Nothing.