



Role of Long-term Use of TPN in GIT Surgically Neonates and its Effect on Cholestasis

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Abstract

Parenteral nutrition formulations are designed to provide nutrients in doses sufficient to meet the patient's daily requirements. Because parenteral nutrition is an extremely complex admixture containing amino acids, dextrose, lipids, water, electrolytes, trace elements, and vitamins. errors in their formulation and compounding have led to serious and lethal complications.

Key Words: Total Parenteral Nutrition, Liver Diseases, Intestinal Failure, Neonates.

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Introduction

Parenteral nourishment definition configuration should consider the security, similarity, which now and again restricts one's capacity to individualize supplement dosages. Wellbeing issues connected with parenteral sustenance definitions have prompted the improvement of rules for safe practices. **1**

The two significant sorts of parenteral supplement arrangements are the customary dextrose amino corrosive arrangement and the TPN. The TPN System includes the expansion of dextrose, amino acids, and lipid emulsion (with electrolytes, nutrients, minor elements, and different added substances) into a solitary compartment. **2**

TPN definitions are utilized much of the time due to the comfort of just a single implantation for parenteral nourishment purposes and the superior resistance and oxidation of intravenous unsaturated fats. The soundness of these details is a worry, notwithstanding, due to the destabilization of the emulsion within the sight of an acidic pH and in view of openness to limits of temperature. For parenteral nourishment, these worries limit the dosages of certain supplements like divalent cations, zinc, and iron as well as amino acids. **3-5**

Methodology

A retrospective study of 20 cases of critically-ill patients whom underwent a GIT surgery, with no needed or received a short term TPN (≤ 14 days) and incubated in NICU (Neonatal Intensive Care Unit), followed by a three-month prospective study on Minia University Pediatric hospital NICU for critically ill patients undergoing major surgeries on GIT and required a TPN plans for more than 14 days was done from January 2019 to April 2020.

• Inclusion Criteria

- Full term neonates.
- Weigh at birth ≥ 1500 gm.
- Normal liver function laboratory profile preoperatively.
- No other major congenital anomalies (e.g., neurogenic, renal, or cardiac).

• Exclusion Criteria

- Cases with high physiological or non-related pathological jaundice.
- Neonates with enteral/ parenteral feeding options.
- Neonates with previous operation or complicated cases.

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On admission to surgical NICU the neonates were labelled for study and a consent from parents after explanation of all the study protocol and procedures was fulfilled. A whole laboratory investigation was taken routinely and follow up **liver function test (LFT) and lipid profile (Total bilirubin)** were collected

daily. The following tables indicates the biochemical outcomes during TPN period of ALT AST, And TSB. The TPN prepared by using conventional SMOF lipid.

Table: Biochemical outcomes of ALT during TPN period using slandered TPN

Case no.	Age (days)	Wt./birth	pathology	TPN (days)	ALT at admission	ALT day1-3	ALT day 4-6	ALT day 7-9	ALT >9 days
					35-48 IU/L				
1	1	1550	TOF	14	35	36	40	42	48
2	1	1525	TOF	13	37	38	40	45	52
3	6	1800	NEC	12	33	35	38	40	42
4	2	2140	IA	14	45	48	48	48	52
5	2	2120	TOF	12	48	49	45	48	51
6	7	1850	NEC	10	36	40	44	42	49
7	7	1910	IP	12	45	44	45	45	48
8	5	2200	NEC	7	50	49	48	48	53
9	8	2300	CDH	8	44	48	48	47	49
10	1	1680	TOF	11	42	43	42	44	48
11	5	1850	NEC	10	38	40	41	42	48
12	10	1950	Malrotation	10	32	35	37	37	41
13	12	2260	IP	8	36	40	42	41	45
14	14	1900	GV	7	41	42	44	46	49
15	9	1700	malrotation	13	42	42	44	44	48
16	5	1750	IA	9	46	48	48	50	52
17	4	2175	IA	9	48	48	47	46	49
18	12	2150	Strangulation	8	39	40	41	43	50
19	2	1800	IP	10	42	45	46	48	54
20	14	2000	IP	12	38	41	43	44	48
Mean	6.35	1930.5		10.45	40.85	42.55	43.55	44.5	48.8
SD	4.34	231.33		2.23	5.21	4.68	3.39	3.25	3.30

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Table: Biochemical outcomes of AST during TPN period using slandered TPN

Case no.	Age (days)	Wt. at birth	pathology	TPN (days)	AST on admission IU/L	AST day1-3	AST day 4-6	AST day 7-9	AST >9 day
1	1	1550	TOF	14	40	41	40	42	47
2	1	1525	TOF	13	41	42	40	45	58
3	6	1800	NEC	12	45	45	38	40	45
4	2	2140	IA	14	48	49	48	48	57
5	2	2120	TOF	12	51	53	45	48	51
6	7	1850	NEC	10	40	45	44	42	55
7	7	1910	IP	12	50	48	45	45	50
8	5	2200	NEC	7	52	51	48	48	58
9	8	2300	CDH	8	48	49	48	47	52
10	1	1680	TOF	11	45	49	42	44	51
11	5	1850	NEC	10	40	45	41	42	49
12	10	1950	Malrotation	10	38	42	37	37	42
13	12	2260	IP	8	40	45	42	41	48
14	14	1900	GV	7	41	48	44	46	50
15	9	1700	malrotation	13	45	47	44	44	48
16	5	1750	IA	9	48	46	48	50	57
17	4	2175	IA	9	52	48	47	46	52
18	12	2150	Strangulation	8	42	45	41	43	52
19	2	1800	IP	10	41	44	46	48	54
20	14	2000	IP	12	40	41	45	48	50
Mean	6.35	1930.5		10.45	44.35	46.15	43.6	44.7	51.3
SD	4.3441	231.33		2.23	4.64	3.28	3.41	3.34	4.32



Table: Biochemical outcomes of TSB during TPN period using slandered TPN

Case no.	Age (days)	Wt. on Admission (gm)	pathology	TPN (days)	TSB on admission (0- 1 mg/dL)	TSB day1-3	TSB day 4-6	TSB day 7-9	TSB >9 day	Wt. on discharge
1	1	1550	TOF	14	0.15	0.23	0.42	0.75	0.8	1650
2	1	1525	TOF	13	0.6	0.52	0.6	0.9	1.5	1600
3	6	1800	NEC	12	0.2	0.32	0.52	0.74	0.92	1850
4	2	2140	IA	14	0.51	0.65	0.85	0.9	1.4	2250
5	2	2120	TOF	12	0.5	0.55	0.65	0.7	0.8	2120
6	7	1850	NEC	10	0.66	0.75	0.8	0.95	1.05	2000
7	7	1910	IP	12	0.62	0.77	0.82	0.85	0.95	2010
8	5	2200	NEC	7	0.52	0.65	0.85	0.95	2.1	2210
9	8	2300	CDH	8	0.22	0.3	0.55	0.6	0.62	2250
10	1	1680	TOF	11	0.5	0.56	0.65	0.85	0.9	1750
11	5	1850	NEC	10	0.54	0.6	0.7	0.75	0.874	1950
12	10	1950	Malrotation	10	0.45	0.6	0.654	0.68	0.77	2100
13	12	2260	IP	8	0.36	0.45	0.48	0.62	0.68	2300
14	14	1900	GV	7	0.4	0.51	0.72	0.75	0.82	2200
15	9	1700	malrotation	13	0.4	0.45	0.47	0.5	0.52	2000
16	5	1750	IA	9	0.52	0.7	0.91	0.95	2.2	2100
17	4	2175	IA	9	0.51	0.625	0.675	0.7	0.75	2250
18	12	2150	Strangulation	8	0.44	0.55	0.6	0.64	0.8	2255
19	2	1800	IP	10	0.45	0.47	0.46	0.47	0.48	2100
20	14	2000	IP	12	0.48	0.49	0.5	0.52	0.6	2250
Mean ± SD	6.35 ±4.34	1930.5 ±231.33		10.45 ±2.24	0.4515 ±0.13	0.53725 ±0.14	0.64395 ±0.15	0.7387 ±0.15	0.86±0.24	2059.75 ±209.28

Table: Biochemical outcomes at termination for parenterally treated neonates vs. non TPN treated neonates

	Units	Non TPN Neonates		SMOF TPN		p-value
		Mean	SD	Mean	SD	
Albumin	g/L	39	1.75	14.1	2.7	≤0.05
Bile Acids	Mg/dL	16.2	12.4	38.5	21	≤0.05
Bilirubin	Mg/dL	0.45	0.13	0.86	0.24	≤0.05
ALT	IU/L	40.85	5.21	48.8	3.30	NS
ALP	IU/L	680	95	717	135	NS
Glucose	Mg/dL	95	2.3	108	3.8	NS
Creatinine	IU/L	0.8	0.25	1.1	0.35	NS
GGT	IU/L	25.13	10.8	174.6	80.56	≤0.05

Results and Discussion

From the previous data collected during 10 to 14 days of close follow up to the critically ill neonates undergoing miscellaneous operations and in need for TPN up to 14 days duration.

According to ALT levels according to long term use of PN, in our experiment there were slight elevation in ALT above normal references in two cases, one which already were on borderline prior to PN feeding and other was having mild degree of sepsis. These results returned to normal value afterwards for one week. After 9th day of PN the number of elevated cases increased to 6 out of 20 but without significant value. These results were the same as study on Evaluation of the long-term use of soybean oil on 36 Individuals receiving SMOF lipid for 12 months, as there was slight increase in ALT,

AST with no clinical significances. 6

While in long term use of TPN for this group, there were elevated Total Serum Bilirubin (TSB) for up to clinical notification. Five cases had a higher bilirubin level than normal range in just 10 days of starting regimen. There was a significance value for cholestasis and jaundice.

Serum Albumin levels showed a significance decrease in their value by time to levels of which clinical symptoms appeared in the form of delayed wound healing, limbs oedema and ascites.

The noticeable increase in GGT (Gamma-Glutamyl Transpeptidase), an enzyme that is found in many organs throughout the body, with the highest concentrations found in the liver. GGT is elevated in the blood in most diseases that cause damage to the liver or bile ducts. Normally, GGT is present in low



levels, but when the liver is injured, the GGT level can rise. GGT is usually the first liver enzyme to rise in the blood when any of the bile ducts that carry bile from the liver to the intestines become obstructed **7**. On Approach to gastrointestinal emergencies research, he emphasises on the importance of GGT elevation on fresh liver and biliary tract pathology.

Both GGT and ALP are increased in liver diseases, but only ALP will be increased with diseases affecting bone tissue. Therefore, GGT can be used as a follow up to an elevated ALP to help determine if the high ALP result is due to liver or bone disease. This was also concluded by A Comparative Study of Serum Gamma-Glutamyl Transpeptidase, serum Alkaline Phosphatase and GGT/ALP Ratio in different liver Disorders done **8,9**.

Regarding hyperglycemia and renal function during TPN for more than 10 days, there were no significance difference between both groups as the close and restricted daily follow-up of serum glucose level and renal functions tests done every 3 days.

The risk of hyperglycemia was predicted to increase by 10% with each additional day in TPN duration. **10**. This result is in accord with many previous studies indicating that duration of TPN treatment was correlated positively with blood glucose levels among patients on TPN. However, this outcome is contrary to that of **11, 12** who did not find a significant correlation between hyperglycemia and duration of TPN. One of the possible explanations for this result is that the patients who require longer duration of TPN are more likely to be critically ill, which in turn results in longer hospital stay and higher risk for inpatient complications. **13** This result might also be simply explained by presuming that the chances of reporting a single glucose value >180 mg/dL would be higher when patients stay on TPN therapy for a prolonged period.

So, in conclusion of our experiment a rapid elevation of LFT may occur with starting the PN but then it became steady and may decrease to border safe rates, while serum Bilirubin and Bile acids had a rapid increase with time to a significant rate that may be clinically evident within the first two weeks of therapy. **15**

Thus make the solutions that may help in decreasing associated liver diseases with prolonged use of TPN is a must and finding substitutes for unsaturated long chain fatty acids could improve these results into a satisfactory result. **15**

Conclusion

There is a significant role with long term use of TPN, especially in critically ill neonate patients undergoing acute massive stress as in GIT surgeries. and it seems that the high content of w6 derived emulsions had a direct influence on these changes specifically in IFALD, and so finding a structured TPN lipid mixture that maintain the daily caloric requirement and also minimizing those complications is crucial.

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