

(TPN)

TPN

**Abnormalities of Liver Function during Total Parenteral Nutrition (TPN): Alteration of Serum Liver Enzyme during Short-term TPN**

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**Purpose:** TPN has been widely used to treat nutritional depletion since the late 1960s. However, many metabolic complications may occur as a result of parenteral feeding. Among these, hepatic complications has received increasing attention. A retrospective review of liver function abnormalities in adult patients who underwent TPN was done to determine the frequency and magnitude of the abnormalities in a liver function test.

**Methods:** From January 2001 to Jun 2001, 160 adult patient receiving TPN were reviewed. Of these, 111 had a malignant disease and 49 had a benign disease. The duration of TPN therapy ranged from 5 days to 52 days, with a mean duration of 14 days. Abnormalities of liver function test were defined as a value greater than the upper normal limit. Forty cases of gastric cancer were analyzed to determine the risk factors that contribute to abnormal liver function in individual patients receiving TPN.

**Results:** Abnormalities of the liver function test appeared after 6-7 days of therapy. Increases in the ALP levels were noted in 34 out of 93 patients (37.6%), in the AST levels

in 42 out of 116 patients (36.2%), in the ALT levels in 54 out of 125 patients (43.2%), in the LDH levels in 20 out of 72 patients (27.8%), in the -GTP levels in 44 out of 81 patients (54.3%), and in the bilirubin levels in 30 out of 126 patients (23.8%). The serum ALP level rose to 1.6 times upper the limit of normal; AST, 1.7 times; ALT, 2.0 times; LDH, 1.2 times; -GTP, 2.4 times; bilirubin, 2.4 times. -GTP value was most sensitive. In 40 gastric cancers, factors as age, the amount of TPN solution, the duration of TPN, intraoperative chemotherapy, transfusion, and postoperative infection were investigated. However, no association with TPN-associated liver function abnormalities was found.

**Conclusion:** The incidences of an abnormal liver function during TPN were 23.8-54.3%. However, the liver function abnormalities that developed during short term-TPN were reversible and not serious. (J Korean Surg Soc 2002;63:409-415)

**Key Words:** Total parenteral nutrition, Abnormalities of liver function

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1960  
 (1)  
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 , 1971 Peden  
 (cholestasis),  
 가 . 3



**Table 1.** Incidence and intensity of liver dysfunction developed during total parenteral nutrition

	Incidence of elevated LFT (%)	Elevated value	Mean interval of increase (days)
ALP ( 280 U/L)	35/93 (37.6)	452.8± 191.9	7.1± 6.2
AST ( 45I U/L)	2/ 116 (36.2)	75.9± 26.0	6.1± 4.5
ALT ( 40I U/L)	54/ 125 (43.2)	78.5± 36.9	6.1± 4.5
LDH ( 450I U/L)	20/72 (27.8)	562.8± 92.1	6.2± 4.0
-GTP ( 63 U/L)	44/81 (54.3)	154.5± 121.5	6.3± 7.1
Bilirubin ( 1.2 mg/L)	30/ 126 (23.8)	2.9± 3.4	7.7± 3.1

**Table 2.** Incidence of abnormal liver function test according to TPN duration

	Less than 20 days	More than 21 days	P*
ALP	30/81 (37.0%)	5/ 12 (41.7%)	0.76
AST	34/97 (35.1%)	8/ 19 (42.1%)	0.61
ALT	43/ 105 (41.0%)	11/20 (55.0%)	0.33
LDH	16/63 (25.4%)	4/9 (44.5%)	0.25
-GTP	37/71 (52.1%)	7/ 10 (70.0%)	0.33
Bilirubin	23/ 106 (21.7%)	7/20 (35.0%)	0.41

\*Chi-square test.

**Table 3.** Mean elevated value of abnormal liver function according to TPN duration

	Less than 20 days	More than 21 days	P*
ALP ( 280 U/L)	412.6± 153.0	691.8± 244.6	0.001
AST ( 45I U/L)	74.2± 26.0	83.4± 26.8	0.38
ALT ( 40I U/L)	81.1± 39.8	75.0± 25.3	0.51
LDH ( 450I U/L)	573.1± 100.9	521.7± 9.7	0.33
GTP ( 63 U/L)	147.8± 102.2	190.1± 203.6	0.0001
Bilirubin ( 1.2 mg/L)	3.3± 3.8	1.4± 0.2	0.23

\*T-test.

3)

44

가

40

ALP가 12/36 (33.4%), AST가 13/37

(35.1%), ALT가 15/39 (38.5%), -GTP가 21/37 (56.8%)

가

160

가

40

**Table 4.** Factors contributed to elevated ALP in 36 patients with gastric cancer during TPN

	Elevated ALT (n=12)	Normal ALT (n=24)	P	
Age (year)	57.5± 8.9	54.4± 8.9	0.33 <sup>†</sup>	
Duration (days)	11.1± 4.2	12.2± 5.6	0.55 <sup>†</sup>	
Amount	IL	2	6	0.69 <sup>§</sup>
	2L	10	18	
Operation	6	15	0.50 <sup>§</sup>	
IOCT*	5	12	0.73 <sup>§</sup>	
Infection <sup>†</sup>	2	3	1.0 <sup>§</sup>	
Transfusion	3	14	0.08 <sup>§</sup>	

\*IOCT = intraoperative chemotherapy through peritoneum; <sup>†</sup> Infection = defined as BT > 38.2 C and WBC > upper limit of normal; <sup>†</sup> T-test; <sup>§</sup> Chi-square test.**Table 5.** Factors contributed to elevated AST in 37 patients with gastric cancer during TPN

	Elevated AST (n=13)	Normal AST (n=24)	P	
Age (year)	56.2± 11.6	57.3± 10.1	0.77*	
Duration (day)	14.7± 7.2	12.5± 6.3	0.34*	
Amount	IL	3	5	1.00 <sup>†</sup>
	2L	10	19	
Operation	6	18	0.15 <sup>†</sup>	
IOCT	3	13	0.09 <sup>†</sup>	
Infection	2	3	1.00 <sup>†</sup>	
Transfusion	4	14	0.10 <sup>†</sup>	

\*T-test; <sup>†</sup> Chi-square test.

(Table 4 7). 38.2°C WBC systemic inflammatory response syndrome (SIRS)

**Table 6.** Factors contributed to elevated ALT in 39 patients with gastric cancer during TPN

	Elevated ALT (n=13)	Normal ALT (n=24)	P
Age (year)	55.9 ± 11.9	55.3 ± 10.7	0.87*
Duration (day)	13.8 ± 8.3	12.2 ± 6.0	0.49*
Amount			0.69 <sup>†</sup>
1L	2	5	
2L	13	19	
Operation	10	13	0.52 <sup>†</sup>
IOCT	5	13	0.32 <sup>†</sup>
Infection	2	3	1.00 <sup>†</sup>
Transfusion	7	12	1.00 <sup>†</sup>

\*T-test; <sup>†</sup> Chi-square test.

**Table 7.** Factors contributed to elevated -GTP in 37 patients with gastric cancer during TPN

	Elevated -GTP (n=13)	Normal -GTP (n=24)	P
Age (year)	56.5 ± 8.0	55.4 ± 12.7	0.75*
Duration (day)	14.9 ± 8.2	13.4 ± 7.2	0.57*
Amount			1.00 <sup>†</sup>
1L	5	4	
2L	16	12	
Operation	13	9	0.75 <sup>†</sup>
IOCH	10	9	0.74 <sup>†</sup>
Infection	2	3	0.63 <sup>†</sup>
Transfusion	10	7	1.00 <sup>†</sup>

\*T-test; <sup>†</sup> Chi-square test.

Table 4 7

ALP , AST

(steatosis)

1960

1974

Dudrick

(8)

12

가

가

가

(6)

(biliary sludge)

(cholelithiasis)

(6,9,10)

가 ,

5

(6,9,10)

40 60%

(6) Grant (3) 93%

20 25% . Grant (3) 100

3 4.5 L

, AST 93%, ALT 89%, LDH

69%, bilirubin 26% . AST 8 ± 4

2 , ALT 10 ± 4 5 , LDH

8 ± 4 1.5 , bilirubin 8 ± 3 2

20 AST,

ALT, ALP, LDH

. Host (11) 20%

, 50 cc/kg/day 6 / 19

(31.6%) 5 10

, Lindor (4) 25%

3L 3 AST

68%, ALP 54%, bilirubin 21% , 9

12 . Suita (12) 30

893

가 1970

35.7%, 1980

22.3%, 1990

18.0%

가

(BCAA)

arginine

taurine

manganese

selenium

2001 (13)

165

16.4%

, ALP, AST, ALT, LDH, -GTP,

37.6%, 36.2%, 43.2%, 27.8%, 54.3%,

23.8%

7

90

(triaditis)

(9)

(3,4,5,11) Host (11)

10

AST가

3 가

(periportal fatty infiltration)

, Grant (3) AST, ALT

6 Lindor (4) 가 , (conjugation) taurine (pericentral or periportal canalicular bile plugs) (5,9) Sheldon (5) (21) 가 (6,22) 가 88% , 10 57% 가 가 (9) Fouin-가 21 (centrilobular) , Fortunet (23) lithocholate가 가 가 (pigment) , 35 가 가 가 21 (9) Messing (24) Nanji (14) 가 가 -GTP 4 6 , 6 -GTP가 가 -GTP가 가 가 14 6 , -GTP가 가 -GTP 3 3 ALP 가 (15) Bengoa (25) 75% ALP (Table 3) 21 -GTP 25% (10 45%) AST, ALT (nonspecific triaditis) (3) (16) 가 (3,9) Suita (12) 30 893 (9,14) Burke , 5 mg/kg/minute . Beath 60 kg 432 g (18) (16) , 25% (13) , 12.5% 가 (19) , 30 (lipoprotein) , Keim Mares-Perlman(20)

가

가

6 (steatonecrosis) .(9)

.(6,7)

Allardyce (26) 60% intralipid  
40% , ALP가

19±2.9 75% . Boelhouwer 가  
(27) 50%

intralipid  
(fat-based TPN)

50% , Bengoa (25)  
(lipid emulsion) 25%

(10 45%) , 2  
bilirubin, ALP, AST, ALT 25% ,  
. Meguid (28) 30%

가 , .(6)

.(29)  
가 cholecystokinin  
, cholecystokinin  
cholecystokinin  
. (30,31)

Capron (32) 가  
, metronidazole  
. Sax (10)

1) 가 , . 2)  
. 3)  
10 30% . 4)  
. 5) . 6) metronidazol

23.8 54.3%

가

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