



# BLOOD AND MARROW TRANSPLANTATION AND NUTRITIONAL SUPPORT



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# HAEMATOPOIETIC STEM CELL TRANSPLANTATION [HSCT]

- **INDICATIONS**

- HEMATOLOGIC MALIGNANCIES; SAA
- SOLID TUMORS
- HEREDITARY DISORDERS

- **TYPES**

- ALLOGENEIC
- AUTOLOGOUS

- **SOURCES OF HSC**

- BONE MARROW
- PERIPHERAL or CORD BLOOD

# RISK FACTORS

- DISEASE STAGE AT THE TIME of TRANSPLANT
- PATIENT'S AGE
- HLA MISMATCH

## OBESITY/ UNDERNOURISHMENT

A LOW BMI [ $<20$ ] WAS SIGNIFICANTLY CORRELATED  
WITH:



TRM



OS



RFS

# MALNOURISHED PATIENTS

- RELAPSED ALL
- LONG-TERM STEROID THERAPY
- HISTORY OF MULTIPLE INFECTIONS
- METABOLIC DISORDERS [NEUROLOGICAL IMPAIRMENT]
- SOLID TUMORS

# TRANSPLANTATION – METABOLIC CHALLENGES

- **NEGATIVE NITROGEN BALANCE**
- **GLUCOSE INTOLERANCE**
- **INCREASE IN THE NEED FOR ANTIOXIDANT VITAMINS**
- **MINERAL DEFICIENCY [ZINC]**

## PHASES

- **CYTOREDUCTION; PANCYTOPENIA; ENGRAFTMENT**

**ORGAN FAILURE [ANY TIME]**

# PHASES

- CYTOREDUCTION

- *NAUSEA, VOMITING, MUCOSITIS, TASTE SENSATION, NARCOTIC ANALGESICS, DIARRHOEA*

- CYTOPENIA

- *INFECTIONS ; DAMAGED INTESTINE; DECONJUGATION of BILE ACIDS*

- ENGRAFTMENT

- *GvHD; GRAFT REJECTION; RETURN of PRIMARY DISEASE*

# NUTRITIONAL SUPPORT RECOMMENDATIONS

- **NOW- BASED ON THE NUTRITION STATUS of THE INDIVIDUAL PATIENT**
- **LOW MICROBIAL DIET**
- **130-150% OF THE ESTIMATED BASAL ENERGY EXPENDITURE  
[30- 50 kcal/kg/day]**
- **PROTEIN: 1,5- 2g/kg/day**
- **LIPIDS- 30- 40% of NON-PROTEIN ENERGY**
- **A BALANCED CALORIC INTAKE WITH BOTH FAT and CARBOHYDRATE IS RECOMMENDED**

# NUTRITIONAL SUPPORT RECOMMENDATIONS

- MCT SEEM TO BE ADVANTAGEOUS IN TPN OVER LCT:
  - MORE WATER SOLUBLE
  - HAVE PROTEIN SPARING EFFECTS
  - DO NOT ACCUMULATE IN THE LIVER OR ADIPOSE  
TISSUE
  - IMPROVE IMMUNE FUNCTION
  - DECREASE INFLAMMATION.



# SPECIALIZED NUTRITIONAL SUPPORT

- GLUTAMINE
- IMMUNOMODULATORY FORMULAS
  - ARGININE
  - $\Omega$ 3 POLYUNSATURATED FATTY ACIDS
  - PURINE/PYRIMIDINES [RNA]

Weisdorf-Schindele S, Schwarzenberg SJ. In Thomas' Hematopoietic Cell Transplantation; third edition 2004.

Masszi T. In The EBMT Handbook 2008; 5th Edition

# GLUTAMINE- 0,57g/kg/day

- ESSENTIAL AMINO ACID [STRESS, HYPERMETABOLISM]
- SCAVENGER of AMMONIA
- PRECURSOR FOR NUCLEOTIDE SYNTHESIS
- POSITIVE EFFECTS ON:
  - NITROGEN BALANCE; INFECTIOUS COMPLICATIONS;  
LENGTH of HOSPITAL STAY
- MAY PROTECT THE LIVER; BE EFFECTIVE [+ VITAMIN E]: VOD

# GLUTAMINE

- **EFFECT ON INTESTINAL MUCOSITIS ?**
- **DECREASE GASTROINTESTINAL MUCOSITIS +**

**INCREASED RISK of RELAPSE or DEATH [PYTLIK]**

Schloerb PR. J Parenter Enteral Nutr 1999;23:117-22; Benes P. Vnitr Lek. 2002;48:1039-48;

Keefe DM. Curr Opin Clin Nutr Metab Care 2007;10:627-31; Barasch A. Oral Oncol 2003;39:91-100

Coghlin Dickson TM. J Parenter Enteral Nutr 2000;24:61-6; Ziegler TR. Ann Int Med. 1992;116:821-8;

Pytlik R. Bone Marrow Transplant. 2002 Dec;30(12):953-61

# EICOSAPENTAENOIC ACID

– **SUPPRESSES** THE INFLAMMATION PROCESS

[ **TNF alfa; IL-1,2,6; LEUKOTRIENS** ]

– **SCAVENGES** FREE RADICALS

– **INHIBITING** PLATELET AGGREGATION

Schick PK. *Biochim Biophys Acta* 1990; **1022**: 49-56. Endres S. *N Engl J Med* 1989; 320: 265-271. Kinsella JE. *Nutrition* 1990; 6: 24-44. Terano T. *Prostaglandins* 1984; 27: 217-232. Meydani SN. *J Nutr* 1991; 121: 547-555.

# IMMUNOMODULATORY FORMULAS

- THE PROMISE OF DECREASING INFECTIOUS  
COMPLICATIONS
- ATTENTION- RISK of DEVELOPMENT GvHD
- THE NEED CLINICAL STUDIES

# INDICATIONS FOR TPN

- SEVERE MALNUTRITION at ADMISSION [**BMI < 18,5**]
- WEIGHT LOSS > **10%** DURING TREATMENT
- IMPOSSIBILITY of ORAL FEEDING or FAILING to MEET

**60-70%** of REQUIREMENTS over **3 DAYS**

# INDICATIONS FOR TPN

## Rzepecki et al.:

DAY +8; BODY WEIGHT; PAB; TRF (ALLO) or RBP (AUTO)

## CITRULLINE

USEFUL MARKER FOR INTESTINAL MUCOSAL DAMAGE INDUCED  
BY CHEMO- and/or RADIOTHERAPY

1-2 WEEKS EARLIER COMPARED WITH THE SUGAR  
PERMEABILITY TEST

# MONITORING OF NUTRITIONAL SUPPORT DURING BMT

- DAILY- FLUID BALANCE- GLUCOSE- ELECTROLYTES-BUN- CREATININE- CALORIE & PROTEIN INTAKE
- TWO TIMES A WEEK- LIVER FUNCTION TESTS- CALCIUM- MAGNESIUM- PHOSPHORUS
- ONCE A WEEK- NITROGEN BALANCE- TRANSFERRIN- ALBUMIN- TRIGLYCERIDES- ZINC



# COMPLICATIONS OF TPN

- METABOLIC COMPLICATIONS
- RELATED TO THE CENTRAL VENOUS CATHETER-CVC

# METABOLIC COMPLICATIONS OF TPN

- ABNORMAL LIVER FUNCTION
- HYPERGLYCAEMIA
- MORE DAYS of DIURETIC DRUGS USE
- TPN MAY SUPPRESS NORMAL APPETITE

T. Masszi. The EBMT Handbook 2008.

Charuhas PM, Parenter Enteral Nutr 1997; 21: 157-161

# ABNORMAL LIVER FUNCTION DURING BMT

- PARENTERAL NUTRITION
- VENO-OCCLUSIVE DISEASE of THE LIVER
- GRAFT versus HOST DISEASE
- INFECTIONS
- SIDE EFFECTS OF DRUGS

[antibiotics, CSA, MTX]

- RELAPSE OF MALIGNANCY

# ABNORMAL LIVER FUNCTION DURING TPN

- SHORTEN TPN CYCLE to 12-20 FROM 24 HOURS
- REDUCE THE NON-PROTEIN CALORIC INTAKE by 10-15% of THE TOTAL DAILY CALORIES
- INITIATE SOME ORAL INTAKE [if possible]
- METRONIDAZOLE
- URSODEOXYCHOLIC ACID

# COMPLICATIONS RELATED TO THE CENTRAL VENOUS CATHETER

- THE MOST COMMON COMPLICATIONS of TPN
- INFECTIONS
- VENOUS THROMBOEMBOLISM
- MECHANICAL OBSTRUCTION, DISLODGMET  
AND LEAKAGE

# TIME OF TPN WEANING

- TPN- PROGRESSIVELY DECREASED WHILE INCREASING FEEDINGS BY THE ORAL ROUTE
- THE PATIENTS CAN COVER  $\geq 50\%$  OF DAILY ENERGY NEEDS- WITHDRAWAL COMPLETE
- GvHD- THE STOOL VOLUME  $< 500$  ML/DAY FOR AT LEAST 2 DAYS
- CITRULLINEMIA  $> 20$  MICROMOL/L

Alonso P. Farm Hosp 2001;25:139-49; Masszi T. The EBMT Handbook 2008;

Martin-Salces M. Nutrition 2008; 7-8: 769-75; Curis E. Curr Opin Clin Nutr Metab Care 2007; 10: 620-6

# ENTERAL NUTRITION

- STIMULATES GALLBLADDER FUNCTION;
- TROPHIC EFFECT ON THE INTESTINE
- IS THEORETICALLY POSSIBLE IN HSCT
- NASOGASTRIC EN SEEMS TO BE INAPPROPRIATE
- PERCUTANEOUS ENDOSCOPIC GASTROSTOMY OR SURGICAL JEJUNOSTOMY
- EN SOON AFTER HSCT – HIGH RATE OF COMPLICATIONS

## TPN > EN

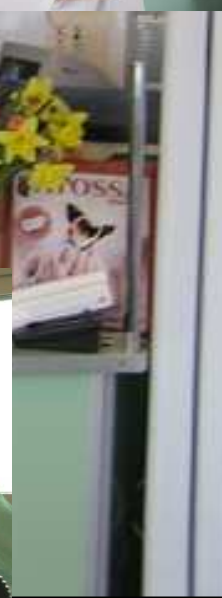
- ALL PATIENTS UNDERGOING HSCT HAVE a CVC
- BETTER MODULATION of FLUID, ELECTROLYTE and  
NUTRIENT ADMINISTRATION [GVHD or VOD]



# CONCLUSIONS

- CAUTION IN THE ROUTINE USE of TPN- THE INCREASED RISK of LINE INFECTION
- WHERE POSSIBLE USE of INTRAVENOUS FLUIDS and ORAL DIET- A PREFERENCE TO PARENTERAL NUTRITION
- THE BENEFITS of GLUTAMINE IN TPN COMPARED TO STANDARD TPN ARE NOW NOT CERTAIN

# Thank you !!!



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