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Editorial ............................................................................................................. 148

Opinion :
SCIENCE PHILOSOPHY AND CRITICAL ATTITUDE OF MEDICAL STUDENTS .......... 149
(Suhartono Taat Putra)

THE ROLE OF 5α REDUCTASE INHIBITOR (FINASTERIDE) IN PROSTATE .......... 150
(Soetojo)

THE EFFECT OF HIGH FREQUENCY (27.11 and 2450 MHz)
ELECTROMAGNETIC FIELDS ON IMMUNITY MODULATION IN MICE .............. 161
(Bambang Guru Irianto and Suhartono Taat Putra)

FUNDAL FLUORESCIN ANGIOGRAPHIC LESION IN AGE-RELATED
MACULAR DEGENERATION .............................................................................. 167
(Gatut Suhendro)

NOISE INDUCED HEARING LOSS IN STEEL FACTORY WORKERS ................. 171
(Sri Hartadj and Heri Kabullah)

TRANSVERSAL STRENGTH OF ACRYLIC RESIN PLATE REPAIRED
BY VISIBLE LIGHT CURED AND HEAT CURED RESIN ..................................... 175
(Yayuk Susilawati)

THE FORMATION OF THE PERIPHERAL RETINAL SCAR
DUE TO CRYORETINOPHYX IN NONPROLIFERATIVE DIABETIC RETINOPATHY
TO MAINTAIN THE CENTRAL AUTOREGULATION RETINA SYSTEM .............. 178
(Gatut Suhendro)

THE MOLECULAR BIOLOGY OF PROSTATE CANCER ................................... 185
(Purnomo Suryohudoyo)

Review Article and Clinical Experience
BASIC PRINCIPLE OF PARENTERAL NUTRITION FOR DIABETIC PATIENTS
(INTRODUCTION WITH SEVERAL EMPIRICAL FORMULAS) ......................... 193
(Askandar Tjoekoprawiro)

Review Article and Clinical Experience
INTRACTABLE EPILEPSY,
FROM BIOMOLECULAR ASPECTS TO SURGICAL TREATMENT ................. 200
(Moh. Hesen Machifoed and Zenaal Muttaqeen)

INTERMITTENT EXOTROPIA IN AVIATOR STUDENT ................................... 208
(Hamidah M. Ali, Rita Tjandra, Lely Eliana)

Abstracts ............................................................................................................ 212

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| Folia Medica | Vol. 40 | No. 4 | Page 148-216 | Oct - Dec 2004 | ISSN 0303-7932 |
Table of Contents

<table>
<thead>
<tr>
<th>No.</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>EDITORIAL Vol 40 No 4 2004</td>
<td>148 - 148</td>
</tr>
<tr>
<td>2</td>
<td>OPINION: SCIENCE PHILOSOPHY AND CRITICAL ATTITUDE OF MEDICAL STUDENTS</td>
<td>149 - 149</td>
</tr>
<tr>
<td>3</td>
<td>The Role of 5α Reductase Inhibitor (Finasteride) in Prostate</td>
<td>150 - 160</td>
</tr>
<tr>
<td>4</td>
<td>The Effect of High Frequency (27.11 and 2450 Mhz) Electromagnetic Fields on Immunity Modulation in Mice</td>
<td>161 - 166</td>
</tr>
<tr>
<td>5</td>
<td>Fundal Fluorescein Angiographic Lesion in Age-Related Macular Degeneration</td>
<td>167 - 170</td>
</tr>
<tr>
<td>6</td>
<td>Noise Induced Hearing Loss in Steel Factory Workers</td>
<td>171 - 174</td>
</tr>
<tr>
<td>7</td>
<td>Transversal Strength of Acrylic Resin Plate Repaired by Visible Light Cured and Heat Cured Resin</td>
<td>175 - 177</td>
</tr>
<tr>
<td>8</td>
<td>The Formation of the Peripheral Retinal Scar due to Cryoretinopexy in Nonproliferative Diabetic Retinopathy to Maintain the Central Autoregulation Retina System</td>
<td>178 - 184</td>
</tr>
<tr>
<td>9</td>
<td>The Molecular Biology of Prostate Cancer</td>
<td>185 - 192</td>
</tr>
<tr>
<td>10</td>
<td>Review Article and Clinical Experience: Basic Principles of Parenteral Nutrition for Diabetic Patients (Introduction with Several Empirical Formulas)</td>
<td>193 - 199</td>
</tr>
<tr>
<td>11</td>
<td>Review Article and Clinical Experience: Intractable Epilepsy, from Biomolecular Aspects to Surgical Treatment</td>
<td>200 - 207</td>
</tr>
<tr>
<td>12</td>
<td>Intermittent Exotropia in Aviator Student</td>
<td>208 - 211</td>
</tr>
</tbody>
</table>
Review Article and Clinical Experience: Basic Principles of Parenteral Nutrition for Diabetic Patients (Introduction with Several Empirical Formulas)

Abstract

To date, complete reports of studies and detailed information about Parenteral Nutrition (PEN) for patients with Diabetes Mellitus (DM) are unavailable. However, clinical experiences with several Empirical Formulas on such patients will be presented. To maintain and restore nutrition of diabetic patients parenterally requires the infusion of Non-Protein Calories (NPC) and a protein source, usually amino acids, in sufficient amounts, in the appropriate ratio, and in a volume of fluid content with normal water balance. Ideally, the amino acids should be spared for protein synthesis rather than utilized as an energy source. Micronutrients and Vitamins, Albumin, Insulin, other drugs and medications may also be added under certain circumstances. Glucose is the carbohydrate of choice in PEN, because it is the normal physiologic substance, which naturally occurs in blood, and it is abundant, inexpensive, and really purified for parenteral administrations. In clinical experiences, it be can given to diabetic patients peripherally in high concentrations up to 20% as long as the osmolarity of the mixture solution does not exceed 800 – 1000 mOsm/l. At least 100 to 150 g of glucose should be supplied for maximum impact on nitrogen balance, and to provide the energy substance for certain key tissues, such as: CNS, Peripheral Nerves, Erythrocytes, Leucocytes, Active Fibroblasts, and certain Phagocytes, which normally require glucose as the sole or major energy source. If such is not the case, gluconeogenesis may happen. Glucose is better to be infused in a mixture with nitrogen source (e.g Triparen with Pan; Amin G, or KA-EN MG3 with Amiparen), because this regimen is associated with an improvement in nitrogen balance as compared to their consecutive or separate administration. To date, clinical evidence has been with fat emulsions providing only LCT (16 to 18 carbon atoms), and currently, MCT (8 to 10 carbons) and LCT emulsion mixture solutions of 20% is increasingly accepted (because MCT may show more rapid triglyceride plasma clearance and oxidation of fat). Recently, it was recommended that in order to get the best nitrogen balance, other than using intermittent administration of carbohydrates, lipid emulsions, and amino acids, the most effective way of administering such substrates, is by three-in-one Big Bag, continuous infusion. Ten Sequential Guidelines of Peripheral PEN for patients with DM are summarized, such as:

1. Osmolarity of Nutrient Solutions < 800 &ndash; 1000 mOsm/l; Hemodynamic condition is the first priority of treatment before PEN to be started at blood glucose < 250 mg/dl; Rapid Glycemic Control should be done if blood glucose level > 250 mg/dl; Either solution of amino acids or fat emulsions are recommended to be infused continuously (not intermittently) within 24 hours; Amino Acid solutions are designed for &ldquo;protein &ndash; sparing&rdquo; rather than nitrogen equilibrium or anabolism, whereas fat emulsions are needed for source of energy and essential fatty acids; etc. Based on clinical experiences, rapid glycemic control (Formula Minus One&rdquo; and &ldquo;Formula Times Two&rdquo;) and Insulin Syringe Pump (&ldquo;Formula Times Twelve&rdquo;) can be used as guidelines in daily practice and emergency cases (Acute Coronary Syndromes, Acute Strokes, and Septic Cases due to Gangrene & Cellulitis, etc). All such &ldquo;Formulas&rdquo; will be on presentation at this symposium. Empirically, each nutrition of 500 ml f.e. Martos (Maltose) 10% or Dextrose 5% can be covered with 8-12 units Actrapid (AR) injected into the bottle of such solutions, 6-10 Unit AR into Potacol-R, and 30-35 units AR into Triparen No.1 or Triparen No.2. Such insulin doses are calculated by Formula 2.5-1 and Formula 5-1 in which both &ldquo;Formulas&rdquo; will be presented at the session. Conclusions: Ten Guidelines of basic principles of Peripheral PEN (Osmolarity < 800 - 1000 mOsm/l and blood glucose < 250 mg/dl) should be recognized by all internists and other associated specialists. However, osmolarity of solutions > 1000 mOsm/l can be given through the central vein. Mixture of nutrients such as KA-EN MG3 (Electrolyte + D 10%) &ndash; Amiparen (AA 10%) &ndash; Fat Emulsions, or Triparen (GFX 4:2:1) &ndash; Pan Amin G (AA 2.72 %) &ndash; Fat Emulsions can be safely and rationally given to patients with DM, and insulin dose regimen can be adjusted by injecting such a dose into the bottle (use Formula 2.5 &ndash; and Formula 5-1)