ELECTROLYTES ET RENUTRITION : L'HYPOPHOSPHOREMIE

Université Nice Sophia Antipolis

JFN – Bordeaux 11 – 13 décembre 2013

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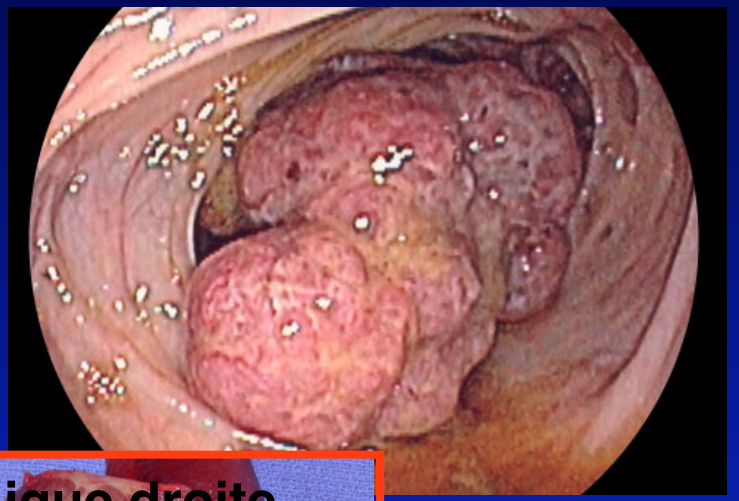
ELECTROLYTES ET RENUTRITION : L'HYPOPHOSPHOREMIE

Pas de conflit d'interêt

CASE REPORT

Un homme de 71 ans, avec perte de poids de 12,5% en 2,5 mois, opéré d'une hémicolectomie droite pour cancer colique



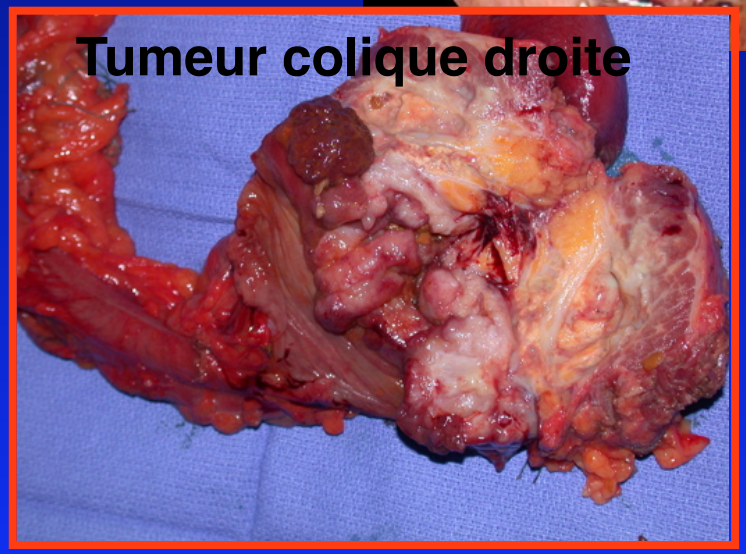
ATCD

Alcolo-tabagique, diabète type 2

En préopératoire

- Alb = 34 g/L

- Nutrition parentérale + liquides per os pdt 10 j



CASE REPORT

Un homme de 71 ans….hemicolectomie droite

En postopératoire : Nutrition parentérale 25 Kcal/j

Après 3 j de NP, il présente :

Fibrillation ventriculaire, choc cardiogénique, convulsions

Diagnostic le plus probable? Quel bilan bio?

Syndrome de Renutrition (SR)

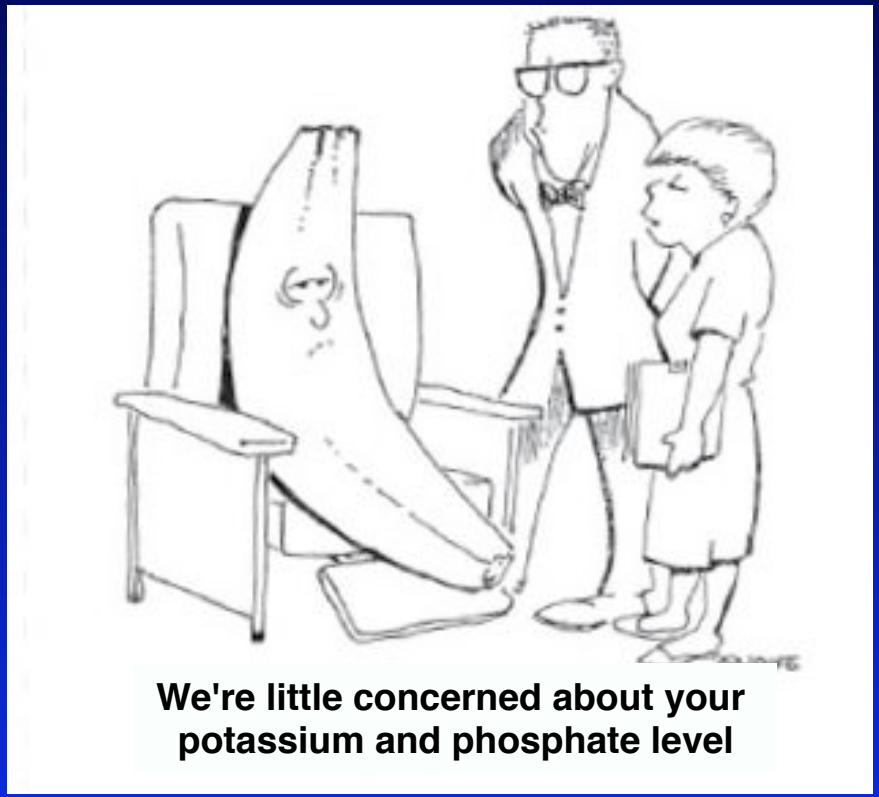
Hypophosphatémie sévère (0,10 mmol/L)

PREVENTION & TRT de L'HYPOPHOSPHATEMIE

1 – Identifier les patients à risque de SR

2 – Contrôler la supplémentation en Ph

3 – Contrôler l'implémentation de la nutrition



FACTEURS DE RISQUE

Box 2 Patients at high risk of refeeding syndrome [134]

- Patients with anorexia nervosa
- Patients with chronic alcoholism
- Oncology patients
- Postoperative patients
- Elderly patients (comorbidities, decreased physiological reserve)
- Patients with uncontrolled diabetes mellitus (electrolyte depletion, diuresis)
- Patients with chronic malnutrition:

  -Marasmus

  -Prolonged fasting or low energy diet

  -Morbid obesity with profound weight loss

  - High stress patient unfed for >7 days

  -Malabsorptive syndrome (such as inflammatory bowel disease, chronic pancrea
  cystic fibrosis, short bowel syndrome)
- Long term users of antacids (magnesium and aluminium salts bind phosphate)
- Long term users of diuretics (loss of electrolytes)

RCS
ADVANCING SURGICAL STANDARDS

Table 1 Criteria for determination of refeeding syndrome risk[3]

One of the following:	Two of the following:
BMI<16 (kg/m^2)	BMI<18.5 (kg/m^2)
Unintentional weight loss >15% in the preceding 3–6 months	Unintentional weight loss >10% in the preceding 3–6 months
Very little or no nutritional intake for more than 10 days	Very little or no nutritional intake for more than 5 days
Low levels of serum potassium, phosphate or magnesium prior to feed	History of alcohol or drug abuse

National Institute for Health and Clinical Excellence (NICE). Nutrition suppot in adults. The Royal Surgeons of England. Clinical guideline 32

FACTEURS DE RISQUE

Refeeding in the ICU: an adult and pediatric problem
Matthew C. Byrnes and Jessica Stangenes

Curr Opin Clin Nutr Metab Care 2011;14:186–92

Symptoms associated with increased risk for refeeding syndrome
Unintentional weight loss >10% within a 1–3 months period
<70–80% ideal body weight
Muscle wasting
Chronic dysphagia
Persistent nausea, vomiting or diarrhea limiting oral intakes
Prolonged fasting or nil per os (NPO) status >7–10 days
Inadequate nutrition therapy (EN or PN) intakes >10 days

Patient : statut nutritionnel grade 4

. dénutri: perte de poids récente ≥ 10% (ou IMC < 18,5 ou < 21 si âge > 70 ans ou Alb < 30 g/L)

. Chirurgie lourde avec haut risque de morbidité

Thibaut R et al, Nutr Clin Metab 2010;24:157–66

PHYSIOPATHOLOGIE DU SR

Jeûn prolongé = état catabolique

. Modif de la composition corporelle

↘ IMC, masse cellulaire, masse grasse et maigre

↗ Masse extracellulaire, ratio masse grasse/maigre

. Modif métaboliques : AG substrat énergétique

↗ Lipolyse, cétogénèse, protéolyse

↘ Néoglucogénèse

. Modif hormonales

↘ Insulinémie & IGF 1

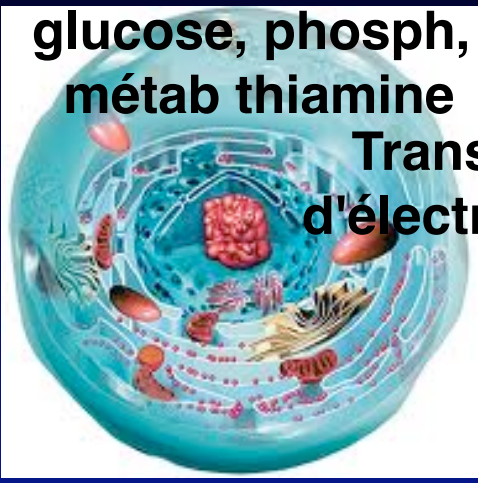
↗ Glucagon & cortisol

Déplétion intracellulaire en électrolytes

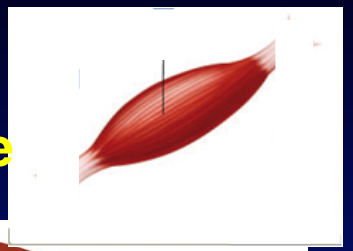
PHYSIOPATHOLOGIE DU SR

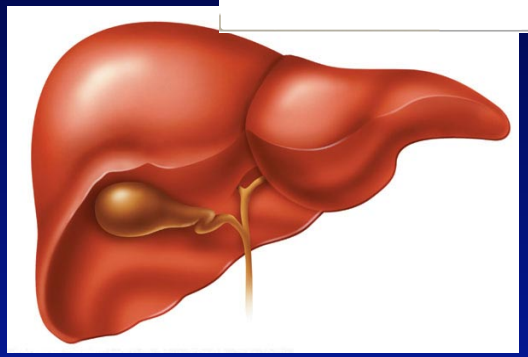
Jeûn

glucose, phosph,
métab thiamine
Transfert
d'électrolytes



protéolyse
État catabolique



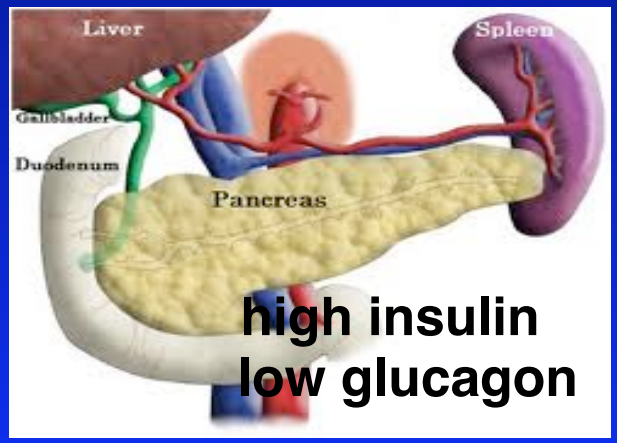


Refeeding syndrome
hypoPh, hypoK, hypoMg, oedèmes, déficit en Vit B1, dépletion en ATP

↓

Défaillance d'org

Protéines & synthèse de glycogène, lipogénèse



high insulin
low glucagon

Pas de néoglucogénèse
Corps cétoniques
Lipolyse & utilisation d'AG

IMC et masse grasse

Vol Extracellulaire

renutrition

Charge aiguë en HC
État anabolique

Insulinopénie
glucagon & cortisol

CONSEQUENCES DE RENUTRITION

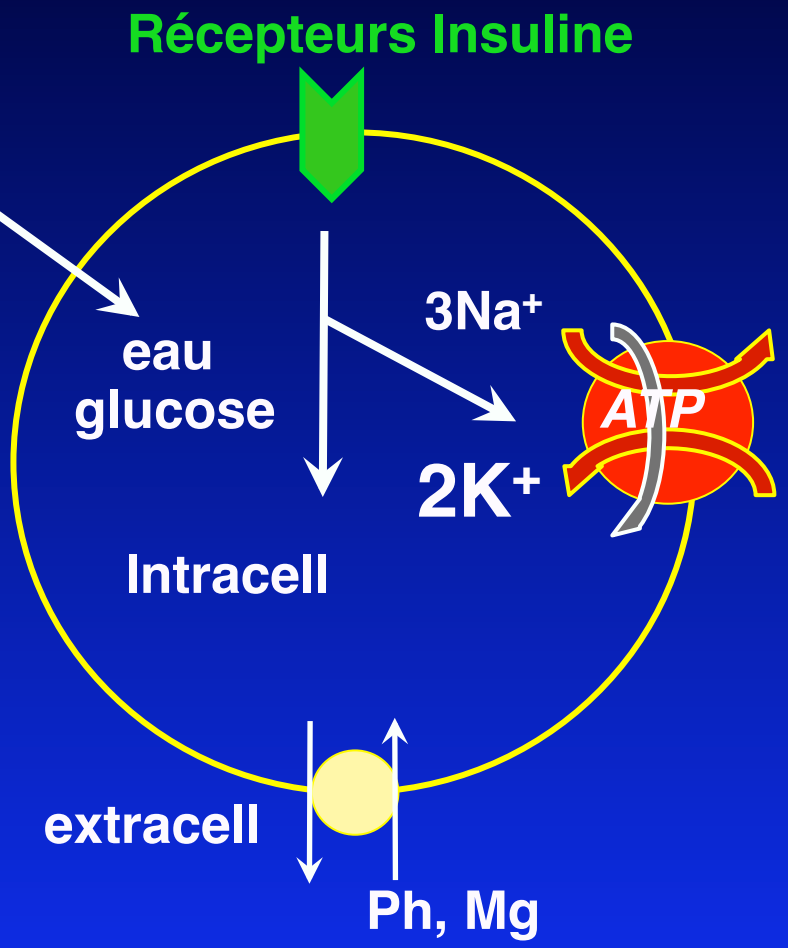
Switch des lipides-protéines vers glucose comme source énergétique

Elévation de l'insuline et de l'utilisation du glucose

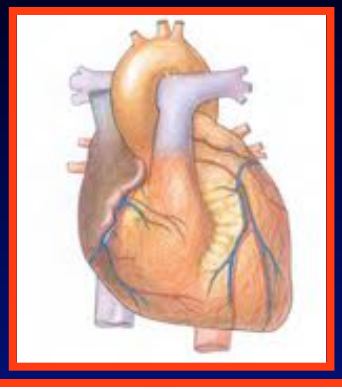
Elévation des besoins en phosph, Mg & thiamine

Activation des pompes transmb

Phosph, Mg, K depletion

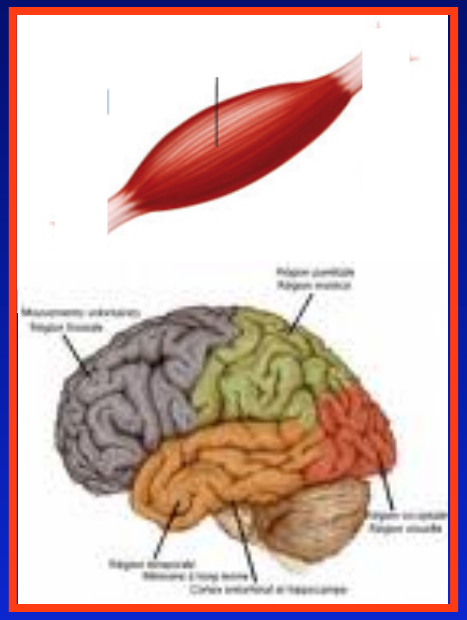


CONSEQUENCES DE L'HYPOPHOSPH



Défaillances d'organes

Défaillance cardiaque & arythmies

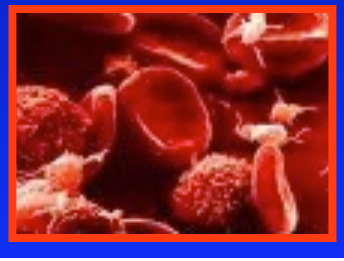


Dysfct neuromusculaire

Déficit musculaire

Défaillance resp. (diaphragme)

Encéphalopathie (coma, convulsions)



Hémolyse

HYPOPHOSPHOREMIE ET SR

Incidence ? 1 to 100% depending on:

. sévérité de l'hypophosph: 0.2–2%

King AL et al South Med J 1987;80:831–5; Camp MA et al Mineral Electrolytes Metab 1990;16:365–8; Kaganski M et al J Intern Med 2005;257:461–8; Fleshner ME et al JPEN 2005;20:108–17; Hoffman M et al J Clin Pathol 2008;61:1104–7

. Gestion de la nutrition:

. NE vs NP Zeki S et al Clin Nutr 2011;30:365–8

. Supplémentation en Ph Martinez MJ et al Nutr Hosp 2006;21:657–60

NPT sans vs avec Ph: 100 to 18%

. sévérité de la sous-nutrition: augmentation du risque si IMC < 15 kg/m^2 Zeki S et al Clin Nutr 2011;30:365–8

. sévérité du patient: Réa vs hospit classique

Rio A et al BMJ 2013;3:e002373

HYPOPHOSPHOREMIE ET SR

Occurrence of refeeding syndrome in adults started on artificial nutrition support: prospective cohort study

Rio A et al BMJ 2013;3:e002373

243 pts en nutrition artificielle (NE & NP)

- Incidence des décès durant la période de renutrition = 13/243 (5.3%) aucun en rapport avec le SR
- Incidence des décès pdt l'hospitalisation = 68/243 (28%)

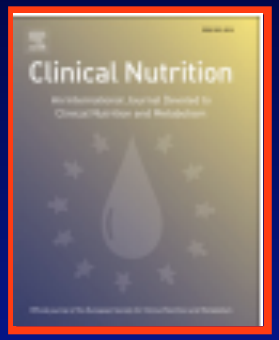
Table 6 Characteristics of the three participants confirmed with refeeding syndrome

	Participant x	Participant y	Participant z
Age (years)	48	23	31
Diagnostic group	Trauma	Gastroenterology	Hepatology
Chronic condition	Alcoholism	Malnutrition	Alcoholism
Route of artificial nutrition support	Enteral	Enteral	Enteral
Baseline received energy (kcal/day)	800	294	325
Baseline energy (kcal/kg)	12.7	6.3	8.1
Potassium replacement	Yes	Yes	Yes
Phosphate replacement	Yes	Yes	Yes
Magnesium replacement	No	No	Yes
Body weight/kg	63	47	40
BMI (kg/m^2)	20	16	16
Intravenous carbohydrate	Yes	Yes	Yes
Survival outcome	Survived	Survived	Survived

BMI, body mass index.

HYPOPHOSPHOREMIE ET SR

Refeeding hypophosphataemia is more common in enteral than parenteral feeding in adult in patients **Zeki S et al Clin Nutr 2011;30:365–8**



pts en nutrition artificielle (NE & NP)

n = 321

92 (29%) à risque d'hypophosph par SR

229 (71%) non à risque d'hypophosph par SR

Hypophosph < 0,6 mmol/L

49 (15%) développaient un SR

25% développaient une hypophosph par SR

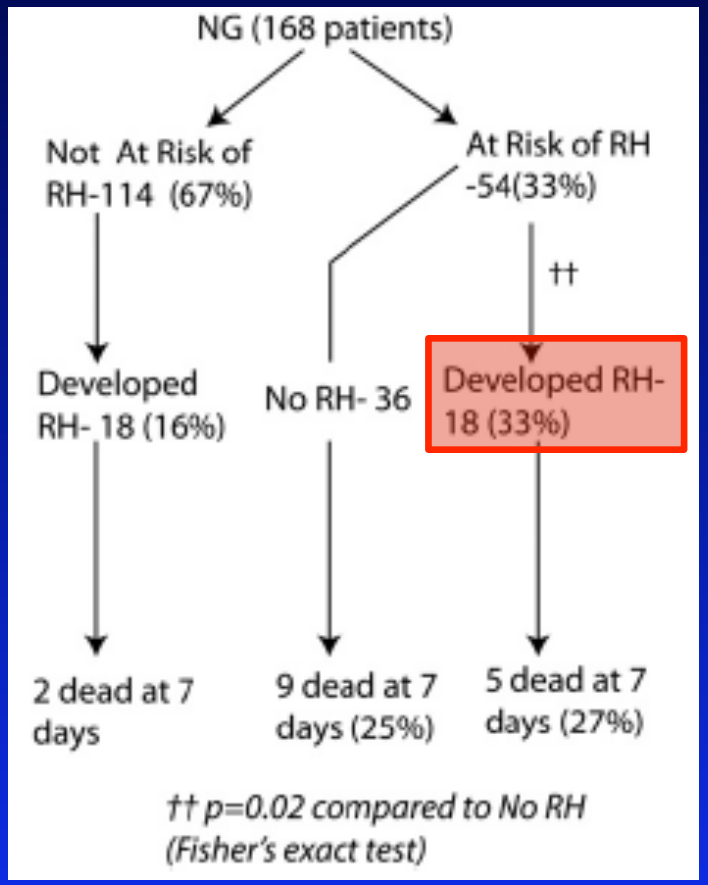
p = 0.003

19% développaient une hypophosph par SR

HYPOPHOSPHOREMIE ET SR

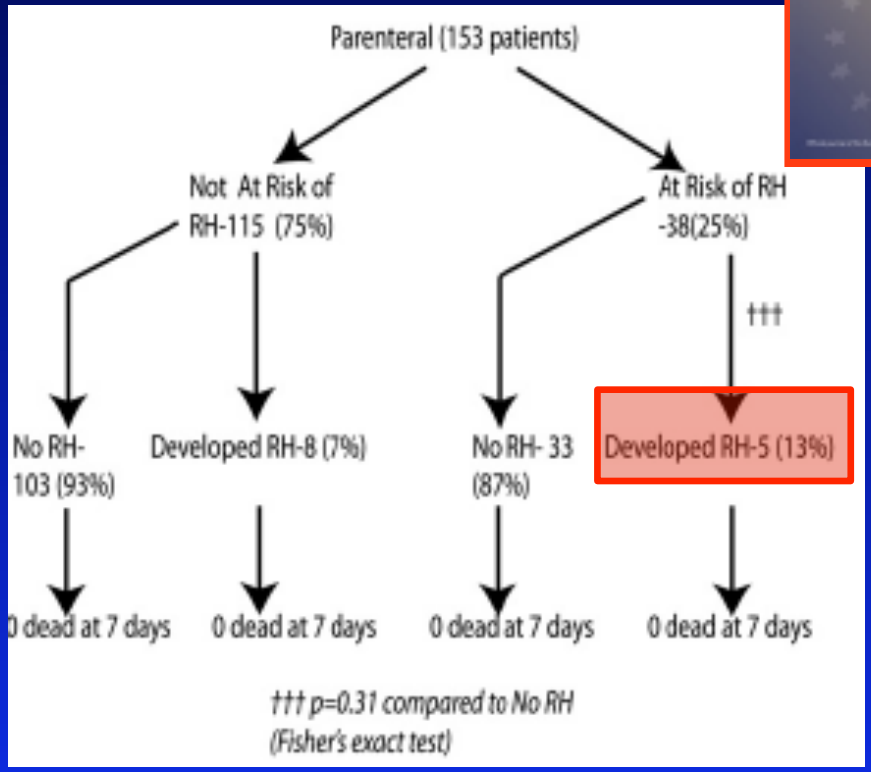
Refeeding hypophosphataemia is more common in enteral than parenteral feeding in adult in patients **Zeki S et al Clin Nutr 2011;30:365–8**

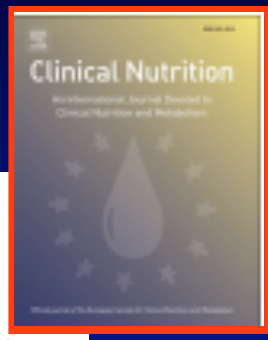
Nutrition entérale



p = 0,03

Nutrition parentérale



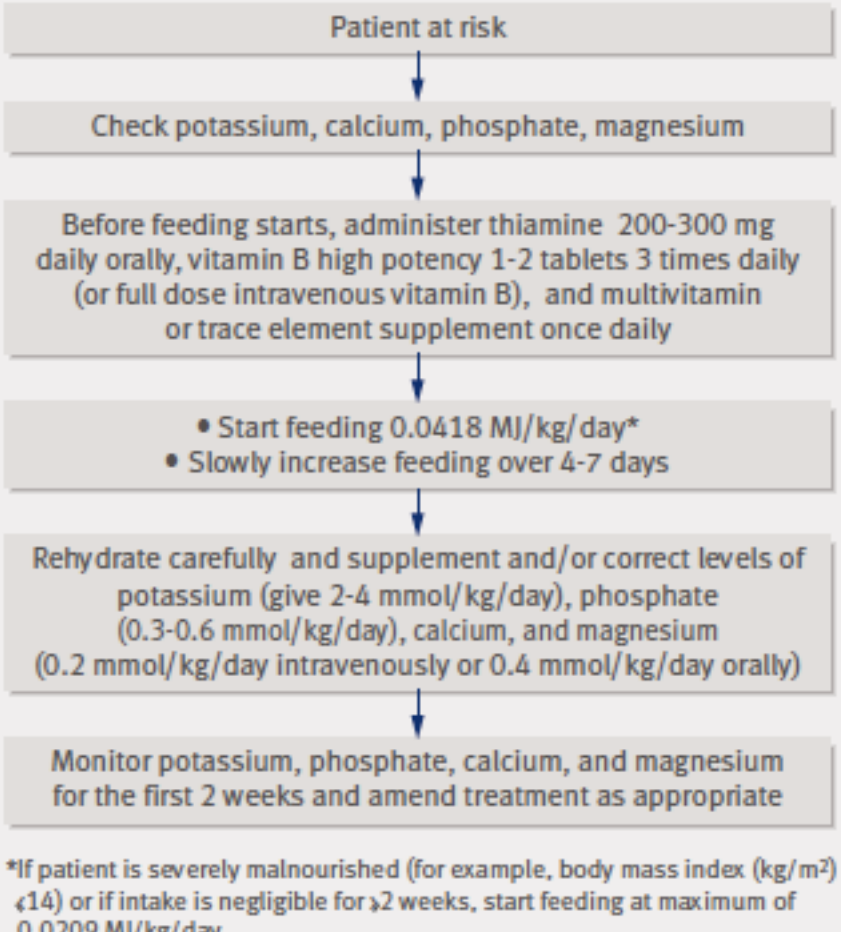


Hypophosph avec SR est + fréquente en NE qu'en NP

PREVENTION ET TRT

Refeeding syndrome: what it is, and how to prevent and treat it

Mehanna HM et al BMJ 2008;336:1495–8



National Institute for Health and Clinical Excellence (NICE). Nutrition support in adults. The Royal Surgeons of England. Clinical guideline 32

Recommendation for phosphate and magnesium supplementation[3 4 6 13]

Mineral	Dose
Phosphate	
Maintenance requirement	0.3-0.6 mmol/kg/day orally
Mild hypophosphataemia (0.6-0.85 mmol/l)	0.3-0.6 mmol/kg/day orally
Moderate hypophosphataemia (0.3-0.6 mmol/l)	9 mmol infused into peripheral vein over 12 hours
Severe hypophosphataemia (‹0.3 mmol/l)	18 mmol infused into peripheral vein over 12 hours
Magnesium	
Maintenance requirement	0.2 mmol/kg/day intravenously (or 0.4 mmol/kg/day orally)
Mild to moderate hypomagnesaemia (0.5-0.7 mmol/l)	Initially 0.5 mmol/kg/day over 24 hours intravenously, then 0.25 mmol/kg/day for 5 days intravenously
Severe hypomagnesaemia (‹0.5 mmol/l)	24 mmol over 6 hours intravenously, then as for mild to moderate hypomagnesaemia (above)

PREVENTION ET TRT

Refeeding in the ICU: an adult and pediatric problem

Matthew C. Byrnes and Jessica Stangenes

Curr Opin Clin Nutr Metab Care 2011;14:186–92

Table 2 Guidelines for electrolyte replacement

Lab value	Adult replacement	Pediatric i.v. replacement	Recommended monitoring
Hypophosphatemia			
General (<2.7 mg/dl)	0.08–0.0.16 mmol/kg[a]	0.08–0.24 mmol/kg	Obtain serum phosphate level 2 h after completion of infusion
Mild 2.3–2.7 mg/dl	0.16–0.32 mmol/kg[a]		
Moderate 1.5–2.2 mg/dl	0.32–0.64 mmol/kg[a]		
Severe <1.5 mg/dl			
Hypokalemia			
General (<3.4–3.5 mEq/l)		0.3–0.5 mEq/kg/dose (infuse over at least 1 h)	Obtain serum potassium level 2 h after completion of infusion
Mild to moderate 2.5–3.4 mEq/l	20–40 mEq[b] **iv**		ECG to rule out arrhythmias
Severe <2.5 mEq/l	Up to 1–1.5 mEq[b]/kg/day		
Hypomagnesemia			
General (<1.8 mg/dl)		25–50 mg/kg up to max single dose of 2 g	Monitor serum magnesium levels every 8–12 h
Mild to moderate (1–1.8 mg/dl)	1 g i.v. magnesium sulfate every 6 h		
Severe (<1 mg/dl)	If symptomatic, treat with 8–12 g daily in divided doses		

PREVENTION ET TRT

Principes généraux

1. Avant la renutrition: remplacement des électrolytes

2. Atteindre les objectifs énerg. en 7–10 j

3. Prudence au cours des 3 1ers jours
   - Renutrition progressive: 5–15 kcal/kg/j
   - Monitorage étroit clinique (poids, coeur) & biologique (K, Mg, Ph, Ca, Na, glycémie)
   - Insuline (iv seringue électrique) + glucose

4. A partir du 4ème jour
   - Augmentation progressive: 10–25% besoins énergétiques ou 200–250 kcal/kg/j
   - Poursuivre la supplémentation en électrolytes et Vit, monitorage biologique /3 jours

CONCLUSION

TRT = Prévention

Ne pas confondre vitesse et précipitation