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COMPARATIVE STUDY OF PARENTERAL NUTRITION VS. ENTERAL NUTRITION IN ENTEROCUTANEOUS FISTULA MANAGEMENT AT A TERTIARY CARE CENTER

General Surgery

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ABSTRACT

Background: Enterocutaneous fistulas (ECFs) are abnormal connections between the gastrointestinal tract and the skin, often resulting from surgical complications, inflammatory bowel disease, or malignancies. Nutritional management plays a critical role in patient outcomes, influencing healing, infection risk, and overall prognosis. This paper compares parenteral nutrition (PN) and enteral nutrition (EN) in the management of ECFs, discussing their advantages, disadvantages, and indications. Nutritional support is a critical component and must be initiated early. The goal is to support healing, maintain lean body mass, and improve immune function. Depending on the individual patient scenario, this is provided through PN or EN. The choice between PN and EN depends on fistula output, location, and the functional status of the gastrointestinal tract. While PN bypasses the gut entirely, providing nutrients intravenously, EN utilizes the gastrointestinal system to deliver nutrition via feeding tubes.

KEYWORDS

Enterocutaneous fistula, Parenteral nutrition, Enteral nutrition, Gastrointestinal fistula management, Nutritional support, High-output fistula, Fistula closure

INTRODUCTION:

Enterocutaneous Fistulas:

Definition and Pathophysiology:

An enterocutaneous fistula is a pathological communication between the intestinal tract and the skin which allows the abnormal passage of gastrointestinal contents to the skin surface. ECFs may develop spontaneously due to conditions like Crohn's disease, malignancy, or radiation injury, but they are most commonly iatrogenic, arising as postoperative complications. The pathophysiology of ECFs involves breakdown of the mucosal barrier and a sustained inflammatory response. This results in fluid loss, electrolyte imbalance, and protein-energy malnutrition. Prolonged inflammation and leakage of intestinal contents also predispose patients to severe infections, delayed wound healing, and systemic complications.

Fistulas are categorized based on their output:
1. **High-output fistulas**: >500 mL/day
2. **Moderate-output fistulas**: 200–500 mL/day
3. **Low-output fistulas**: <200 mL/day.

They are also classified by:

- **Anatomical origin**: (e.g., duodenal, jejunal, ileal, colonic)
- **Complexity**: Simple (single tract, no associated abscess or obstruction) vs. Complex (multiple tracts, associated sepsis, or bowel obstruction).

Etiology Of Enterocutaneous Fistula:

- **Postoperative complications**: The most common cause, particularly after bowel resections, adhesiolysis, or anastomotic breakdown.
- **Inflammatory Bowel Disease**: Especially Crohn's disease, which contributes to spontaneous fistula formation due to transmural inflammation.
- **Malignancies**: Tumor erosion into adjacent bowel or skin.
- **Radiation enteritis**: Late complication of abdominal or pelvic radiation therapy.
- **Infectious diseases**: Including tuberculosis or actinomycosis.

Clinical Features Patients may present with:

- Drainage of enteric content from the skin
- Abdominal pain
- Fever and signs of sepsis
- Electrolyte abnormalities
- Malnutrition (weight loss, hypoalbuminemia)

Diagnostic Workup:

- **Imaging**: CT scan with oral/rectal contrast to delineate the fistula tract and identify any abscesses.
- **Fistulography**: Injection of contrast into the external opening to visualize communication.
- **Endoscopy**: Helps locate the internal opening and assess for contributing mucosal disease.
- **Laboratory tests**: Monitor serum albumin, electrolytes, WBC count, and renal function.

Caloric Requirements:

Postoperative and critically ill patients often experience a **hypermetabolic, catabolic state** due to surgical stress, inflammation, or infection.

Clinical Condition	Estimated Energy Needs
Normal recovery	25–30 kcal/kg/day
Moderate stress (e.g., GI resection, uncomplicated ECF)	30–35 kcal/kg/day
Severe stress (e.g., sepsis, high-output fistula)	35–40+ kcal/kg/day
Obese patients (BMI > 30)	Use **adjusted body weight**

ECF patients often require **35–40 kcal/kg/day** due to high protein loss and ongoing fluid/electrolyte losses.

Macronutrient Distribution

A. Proteins

- **1.5–2.5 g/kg/day** in surgical, septic, or fistula patients
- ECF patients may lose **20–100 g/day** of protein via fistula output

B. Carbohydrates

- 50–60% of total calories
- Avoid overfeeding; glucose infusion rate should not exceed 5 mg/kg/min

C. Fats

- 20–30% of calories
- Helps provide concentrated energy and reduce CO□ production

Enteral Nutrition (EN): Used when the GI tract is at least partially functional.

Types Of Enteral Feeding

Type	Indication
Nasogastric (NG)	Short-term (<4 weeks), stomach intact
Nasojejunal (NJ)	If gastric feeding not tolerated

Gastrostomy / PEG	Long-term (>4 weeks), upper GI access
Jejunostomy	Long-term, post-gastrectomy or in high risk of aspiration

Formulas

Formula Type	Composition	Use
Polymeric	Whole protein, normal digestion	Standard patients
Elemental	Hydrolyzed protein, low fat	Malabsorption or short bowel
Immune-modulating	Glutamine, omega-3, antioxidants	Critically ill or surgical patients
High-protein	↑ Protein	Wound healing, catabolic states

Parenteral Nutrition (PN): Used when the GI tract is non-functional or contraindicated.

Indications
- GI obstruction
- Short bowel syndrome
- Intractable vomiting or diarrhea
- High-output fistulas

Routes

Route	Duration	Description
Peripheral PN (PPN)	Short-term, <2 weeks	Lower osmolarity (≤900 mOsm/L)
Total PN (TPN)	Long-term	Central venous access; hyperosmolar solutions

Components of TPN

Component	Amount	Purpose
Dextrose	3–5 mg/kg/min	Main energy source
Amino acids	1.2–2.0 g/kg/day	Protein supply
Lipids	20–30% of kcal	Essential fatty acids
Electrolytes	Customized	Based on lab values
Vitamins & Trace Elements	Daily requirement	Prevent deficiencies
Fluid	~30–35 mL/kg/day	Adjusted for fluid status

Nutritional Transition in ECF

1. Acute phase (0–7 days):
o Stabilization, NPO if needed
o IV fluids, electrolytes, PN support

2. Adaptation phase (7–30 days):
o Assess for EN trial if feasible (e.g., distal feeding tube)

3. Rehabilitation phase (after 30+ days):
o Promote oral or enteral intake
o Consider reconstructive surgery if fistula persists.

MATERIALS AND METHODOLOGY:

Study Design:

A retrospective comparative study was conducted using patient records from our tertiary care hospitals between 2023 and 2025 at a tertiary care center viz Vilasrao Deshmukh Government Medical College, Latur, Maharashtra, India. A total of 50 adult patients diagnosed with enterocutaneous fistula were enrolled. Patients were divided equally into two groups based on the primary nutritional intervention received: 25 patients received parenteral nutrition (PN) and 25 received enteral nutrition (EN).

Data collected included demographics, fistula characteristics (output volume, location), nutritional status (BMI, serum albumin), length of hospital stay, rate of spontaneous fistula closure, infection rate, and mortality. Statistical analysis was performed using SPSS version 25.0. Categorical variables were analyzed using Chi-square tests, and continuous variables were compared using t-tests. A p-value of <0.05 was considered statistically significant.

Inclusion and Exclusion Criteria:

Inclusion Criteria:
- Patients diagnosed with enterocutaneous fistula.
- Patients requiring nutritional support due to malnutrition or gut dysfunction.
- Individuals with stable or unstable metabolic conditions requiring PN or EN.
- Adults aged 18 and above with documented medical history of gastrointestinal surgery or disease.

Exclusion Criteria:
- Patients with non-enterocutaneous fistulas (e.g., tracheoesophageal, vesicointestinal).
- Individuals with terminal illnesses where nutritional support is deemed non-beneficial.
- Patients with contraindications to PN or EN, such as severe sepsis unresponsive to intervention.
- Pediatric patients (under 18 years) due to differing nutritional needs and management approaches.

Management Principles The "SNAP" approach is a cornerstone in ECF management:
1. Sepsis control
2. Nutritional optimization
3. Anatomical definition
4. Planned surgical intervention

Parenteral Nutrition (PN): PN is often the preferred nutritional support in high-output ECFs (>500 mL/day) or when the distal gut is nonfunctional. It provides essential macronutrients, vitamins, and minerals intravenously, allowing bowel rest and reducing fistula output. However, PN is associated with risks such as catheter-related infections, metabolic complications (hyperglycemia, liver dysfunction), and high costs. Despite these drawbacks, PN remains a lifesaving intervention for patients with severe malnutrition or intestinal failure.

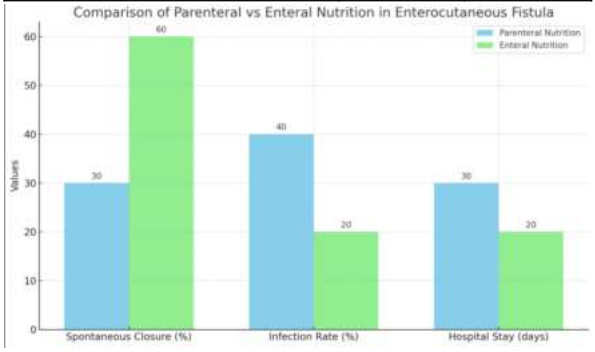
Statistics On PN:
- PN is utilized in approximately 60% of ECF cases where enteral feeding is not feasible.
- Studies report catheter-related bloodstream infection rates of 10-20% among PN-dependent patients.
- Mortality rates for patients on PN alone range from 15-30%, depending on comorbidities and sepsis risk.

Enteral Nutrition (EN) EN is preferred in patients with low-output fistulas (<500 mL/day) where the distal gut is functional. It maintains gut integrity, reduces bacterial translocation, and enhances immune function. EN formulations can be tailored based on caloric and protein requirements. However, complications such as increased fistula output, abdominal discomfort, and difficulty in tube placement limit its use in some patients. Specific enteral feeding approaches, including fistuloclysis and distal feeding, have shown promise in select cases.

Statistics On EN:
- EN is successfully utilized in 40% of ECF cases where a functional distal intestine allows for enteral feeding.
- Studies suggest a 10-15% increase in spontaneous fistula closure rates with EN compared to PN.
- Patients on EN experience a 20-30% reduction in hospital stay duration compared to those solely on PN.

Outcomes In ECF Management: PN vs. EN

Outcome	PN Group	EN Group
Patients Treated	25	25
Spontaneous Closure Rate	30%	60%
Infection Rate	40%	20%
Average Hospital Stay (days)	30	20



ECF treated with TPN

Comparison and Clinical Decision-Making:

The decision between PN and EN is individualized, considering factors like fistula anatomy, output, and patient condition. In stable patients with an accessible distal intestine, EN is preferred due to its physiological benefits and cost-effectiveness. PN is indicated when EN is not feasible due to gut dysfunction or high-output fistulas. In some cases, a combination approach, integrating PN for initial stabilization followed by EN transition, is beneficial. Both PN and EN have distinct roles in ECF management. While PN is essential for severe cases requiring bowel rest, EN supports gut function and enhances recovery in suitable patients. Optimal nutritional strategies should be guided by multidisciplinary teams to improve patient outcomes and reduce complications.

CONCLUSION:

The evidence gathered in this study highlights the benefits of a tailored, patient-centered approach in selecting the optimal nutritional modality. EN is associated with shorter hospital stays, improved spontaneous closure rates, and reduced risk of infection, making it the preferred method when conditions allow. PN remains the mainstay for more complex cases where EN is contraindicated. Ultimately, early nutritional intervention, guided by a multidisciplinary team, is key to improving prognosis, enhancing quality of life, and reducing morbidity and mortality in patients with ECFs.

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