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Survival Rates of Patients with Advanced Dementia Following Percutaneous Endoscopic Gastrostomy (PEG)

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1. Abstract

1.1. Background

Dementia is a progressive, neurodegenerative, terminal syndrome, that causes gradual decline of cognitive abilities that affects a person's ability to perform daily activities. Patients with advanced dementia often struggle with eating disorders, which serve as a poor prognostic indicator. Feeding via a tube is a common practice to support patients unable to eat or swallow. In Israel, Percutaneous Endoscopic Gastrostomy (PEG) is widely used for advanced dementia patients, despite the lack of evidence showing its benefit.

1.2. Study Endpoints

1. Primary Endpoint: To investigate the survival rates of patients with advanced dementia following PEG.

2. Secondary Endpoint: To identify risk factors associated with higher mortality rates.

1.3. Methods

A single-center, retrospective study was conducted at "Bnai Zion" Medical Center, Haifa. Data on patients' demographics, the Charlson Comorbidity Index, medications, and living situations (home or nursing facility) were extracted from the hospital information systems. The Mortality database was collected from the register of residents and analyzed using statistical methods (Kaplan-Meier survival curves, and Cox regression).

1.4. Results

Survival analysis demonstrated a progressive decline in post-PEG survival rates, with 82.6% of patients surviving at 30 days, declining to 63.6% at 3 months, 52% at 6 months, and 45% at 1 year. Multivariate analysis revealed several factors significantly associated with increased mortality: male gender, higher comorbidity burden (as measured by the Charlson Comorbidity Index), and PEG placement during acute hospitalization versus outpatient setting. These findings remained statistically significant after adjusting for age and other potential confounding variables.

1.5. Conclusion

PEG during hospitalization, high comorbidity burden, and male gender are significant risk factors for increased mortality. Factors like older age, procedure indication, or living in nursing facilities did not correlate with survival outcomes.

2. Introduction

Dementia is an incurable syndrome leading to gradual loss of cog-

nitive and daily functions. In advanced stages, patients often refuse to eat, develop swallowing difficulties, or experience recurrent aspiration. At this stage, the prognosis is grim, with mortality within six months often reaching 40% [1]. Modern medicine has limited tools to intervene effectively [2]. Feeding tubes are widely used for nutritional support when oral feeding becomes insufficient or impossible. The most common indications include severe dysphagia following a stroke or advanced dementia. However, despite their initial promise, recent evidence suggests that feeding tubes in advanced dementia patients do not improve survival or quality of life [3]. They are often associated with complications including: infections, perforation, bleeding, tube blockage or dislocation, and aspiration pneumonia [4-5,7-9,17-25]. The post-processing mortality rates were reported as 4.1%-26%; The leading etiologies were pneumonia, urinary tract infection, and cardiovascular diseases [13]. To identify patient populations at risk of complications and mortality, one study found that the primary risk factors for mortality following PEG (percutaneous endoscopic gastrostomy) insertion were advanced age, male gender, and diabetes [14]. In alignment with the medical literature, recommendations from gastroenterological and geriatric associations [28,29] were updated, advising against performing PEG in patients with advanced dementia. A recent study demonstrated a significant reduction in gastrostomy tube placement among nursing home residents with advanced cognitive impairment (ACI), showing a decrease of 50% in the rate of the procedure, from 11.7% to 5.7%, between 2000 and 2014 [11]. In Israel, where the frequency of PEG procedures remains relatively high, there is ongoing debate regarding their effectiveness in patients with advanced dementia. This dilemma has also been addressed in discussions under the framework of the Dying Patient Law Committee. An Israeli study reported a 30-day post-PEG mortality rate of approximately 29% among hospitalized patients, compared to 13% in a matched control group of similar age, gender, and illness [15]. Another study by the same group found that performing PEG during hospitalization increased mortality rates, while delaying the procedure by 30 days improved survival outcomes [16]. Despite concerns about its benefits, tube feeding continues to be widely used in patients with severe dementia. However, no official data are available on the prevalence of tube feeding in advanced dementia patients in Israel, either generally or specifically with gastrostomy tubes. In a study conducted by Clearfield et al., before the introduction of professional guidelines opposing PEG use, the prevalence of tube feeding in Canadian facilities was significantly lower compared to Israeli facilities. Among Canadian-Jewish institutions, a higher rate of gastrostomy feeding was noted compared to other facilities. The authors attributed these differences to a combination of administrative factors (such as financial incentives) and religious, cultural, and national considerations [26]. Another Israeli study, by Dwolatzky et al., showed that gastrostomy was superior to nasogastric feeding for long-term tube feeding in patients without acute illness, offering advantages in terms of survival and reduced aspiration rates [27]. At the Gastroenterology Institute at Bnai Zion Hospital, a unique clinic was established in recent years to provide consultations with legal guardians of patients with advanced dementia before PEG placement. This initiative aimed to make the decision-making process more deliberate and informed rather than automatic. As part of the clinic's activities, the team reviewed referrals for the procedure, candidates' medical records, and laboratory results to identify absolute contraindications and avoid unnecessary harm. During consultations with guardians and in guidance issued to nursing homes, the clinic recommended the first tube replacement at the gastroenterology unit within 6–9 months of initial placement. However, it seems that only a small proportion of patients comply with this recommendation. A former study of the decision-making process of advanced dementia patients' guardians sheds light on the layers of meaning of the Israeli discourse regarding end-of-life issues, the families of most patients did not discuss end-of-life issues with them. The overwhelming preference for using the technology was interpreted as life-saving, in contrast to comfort feeding, which was deemed euthanasia. The reasons given for the decision to tube feed were drawn from a range of outlooks: religion, the patient's earlier survival capacity, and pragmatic considerations involving relations with nursing home staff [6]. Between July 2014 and June 2016, approximately 200 PEG procedures were performed on patients evaluated at the clinic, with their guardians participating in the consultations. This study presents retrospective data collected at the clinic, aiming to assess the survival rates of patients who underwent the procedure and to identify risk factors for mortality and morbidity following PEG placement.

Table 1: Patient Characteristics.

Variable	**Value**
Sex (Male:Female)	56:140
Age (Median)	83 (Range: 52-97)
Charlson Comorbidity Index (Mean)	3 (Range: 0-11)
Number of Medications (Mean)	5.5 (Range: 0-14)
Residency	Institutionalized: 147
	Home: 48
Indication for PEG	Dementia: 153
	Other: 43
PEG Timing	In-Hospital: 7
	Ambulatory: 190

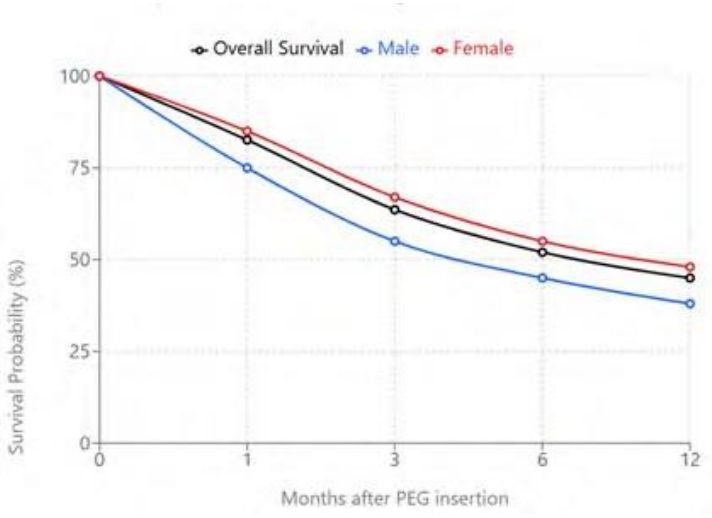

Figure 1: Kaplan - Meier Survival Analysis After PEG Insertion.

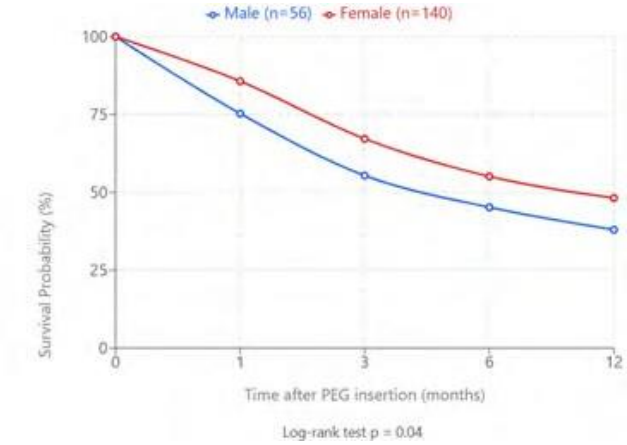

Figure 2: Kaplan-Meier Survival Curves Stratified by Sex.

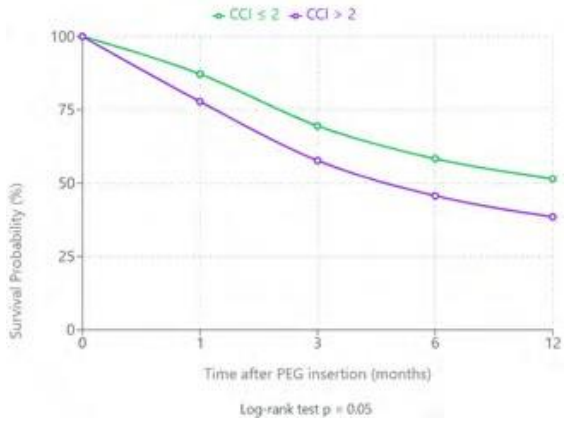

Figure 3: Kaplan-Meier Survival Curves Stratified by Charlson Comorbidity Index.

3. Methods

3.1. Study Design

A retrospective, single-center study was conducted at "Bnai Zion" Medical Center, Haifa. Patients with dementia who underwent PEG between July 2014 and June 2016 were identified using the hospital's electronic medical database. Data extracted were entered into an Excel spreadsheet for analysis. Patients who had undergone surgical gastrostomy were excluded.

3.2. Ethics

The study was approved by the institutional review board (IRB) of "Bnai Zion" Medical Center.

3.3. Outcomes

The primary outcome of the study was post-interventional survival in patients with advanced dementia following PEG.

The secondary endpoint is to identify risk factors associated with higher mortality rates.

3.4. Data Review

Using the electronic medical records system, we collected comprehensive patient data encompassing multiple clinical and demographic variables. The demographic data included age at the time of procedure and gender, while clinical parameters comprised the Charlson Comorbidity Index and the total number of prescribed medications. We documented each patient's living situation, specifically whether they resided at home or in a nursing facility; In addition, we have documented the procedural setting - distinguishing between ambulatory procedures and those performed during hospitalization. The medical indication for PEG placement was recorded for each case. Additionally, we tracked patient outcomes through survival status, and for deceased patients, we documented their date of death to enable survival analysis.

4. Statistical Analysis

Descriptive statistics were calculated for all variables and reported as means, medians, or proportions. Univariate analyses were performed using t-tests for means or Fisher's exact tests for categorical variables. Kaplan-Meier survival curves were used for survival analysis, and Cox regression was applied to determine hazard ratios (HRs) for variables predicting mortality. A p-value of <0.05 was considered statistically significant.

5. Results

Analysis of survival outcomes revealed a gradual decline in patient survival over the follow-up period. The initial 30-day survival rate was 82.6% (95% CI: 76.5-87.2%), which decreased to 63.6% (95% CI: 56.4-70.0%) at three months post-procedure. By six months, approximately half of the patients remained alive, with a survival rate of 52.0% (95% CI: 45.2-59.2%). The one-year survival rate further declined to 45.0% (95% CI: 37.8-51.9%). In examining factors

associated with mortality, univariate analysis revealed several significant predictors. Male gender emerged as a consistent risk factor across different time points, associated with higher 30-day mortality (OR=2.77, 95% CI: 0.9-8.35, p=0.04) and 90-day mortality (OR=2.3, 95% CI: 1.08-4.84, p=0.02). Notably, patients who underwent PEG placement during hospitalization demonstrated significantly higher mortality risk at both 30 days (OR=11.6, 95% CI: 1.4-91.9, p=0.0005) and 90 days (OR=6.8, 95% CI: 0.93-76.5, p=0.01). Additionally, patients who died within 90 days of the procedure had a significantly higher mean Charlson Comorbidity Index compared to survivors (3.69±1.98 vs. 2.86±2.0, p=0.02). Subsequent multivariate analysis confirmed the independent prognostic significance of both male gender and higher Charlson Comorbidity Index (both p=0.05). Interestingly, other clinical variables including age, number of medications, residential status, and primary indication for PEG placement did not demonstrate significant associations with mortality outcomes. These findings were further supported by Kaplan-Meier survival analyses, which illustrated the survival differences between patient subgroups based on these significant predictors.

5.1. Patient Demographics and Procedure Characteristics

A total of 196 patients underwent PEG insertion at "Bnai Zion" Medical Center and were included in this study. Among these, 140 patients (71%) were female. The mean age of the patients was 80.6 years, and the average number of medications taken was 5.5.

6. Discussion

Despite research evidence showing the limited efficacy of PEG and clinical guidelines advising against tube feeding in advanced dementia, PEG remains widely used among this population, particularly for residents of nursing homes in Israel. For several years, a multidisciplinary clinic at the gastroenterology unit at "Bnai Zion" Medical Center aimed to identify absolute contraindications for the procedure and to ensure a meaningful decision-making process with the legal guardians of patients. In this retrospective study, we collected survival data for patients who underwent PEG at the gastroenterology unit between mid-2014 and mid-2016. In our cohort, overall survival rates were 82.6% at 30 days, 63.6% at 3 months, 52% at 6 months, and 45% at 1 year.

Systematic reviews published in recent years summarize observational studies showing similar survival percentages [1-5]. For instance, one study found mortality rates of 20% at 30 days, 37% at 90 days, and 58% at 1 year [30]. Male sex, advanced age, and lower serum albumin levels were identified as risk factors for higher mortality in those studies [31]. In our study, male sex emerged as a significant risk factor for mortality. This finding aligns with prior evidence that men are more vulnerable to complications and mortality after interventions, possibly due to greater frailty and higher rates of comorbid vascular conditions. Unlike other studies, we did not find advanced chronological age to be a risk factor for mortality in our cohort. Instead, a higher Charlson Comorbidity Index was strongly associated with mortality. This discrepancy might reflect our cohort's higher control of underlying diseases, which were accounted for in the Charlson Index but not always considered in other studies. A higher Charlson Index score was, as expected, associated with increased mortality. This underscores the importance of considering the burden of chronic diseases when deciding on PEG placement [8-12]. In recent years, Israeli studies have also examined the topic of feeding tubes in advanced dementia. For example, one study showed that in 165 Israeli patients with dementia, the mean time from PEG placement to death was 7 months, with no improvement in serum albumin levels—a marker of nutritional status—following the procedure (32). Another Israeli study reported a 16.9% 30-day mortality rate and 50% survival at 1 year among 189 patients with dementia who underwent PEG. Post-procedure serum albumin levels were identified as a prognostic marker for survival [33]. Contrary to many studies in the literature, which often include heterogeneous populations, our study included only patients who underwent a comprehensive evaluation. This evaluation considered recent diagnoses, medications, and laboratory findings. If significant electrolyte imbalances, acute infections, or other contraindications were identified, the procedure was postponed or canceled. Most procedures were performed in an ambulatory setting, as institutional policy strongly discouraged performing PEG during hospitalization due to the higher associated mortality rates [7-8]. The main limitation of this study is the lack of a control group. Ideally, we would compare outcomes between patients who underwent PEG and those who were recommended for the procedure but ultimately did not undergo it. However, nearly all legal guardians chose to proceed with the procedure, limiting our ability to create a control group. Another limitation stems from the retrospective nature of the study, which restricted us to data already recorded in the medical database. Due to the anonymity required for ethical approval, we could not supplement the data by contacting caregivers or nursing home staff. Additionally, the study's single-center design limits the generalizability of its findings. Future multicenter studies with a control group are needed to better understand the risks and benefits of PEG in advanced dementia. Based on our findings, which reveal a one-year mortality rate of 55% and significantly higher mortality among patients with elevated comorbidity burden, we suggest a careful reconsideration of PEG placement in advanced dementia patients with severely reduced oral intake. While acknowledging that individual cases may vary and that this decision remains complex and multifaceted, our data suggests that PEG insertion in this patient population may not significantly alter the natural course of their disease, particularly in those with higher Charlson Comorbidity Index scores.

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