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Research Article

# CLINICAL OUTCOMES OF HAEMORRHOIDAL ARTERY EMBOLIZATION FOR GRADE II AND ABOVE HAEMORRHOIDAL DISEASE: A PROSPECTIVE STUDY COMPARING NBCA AND PVA PARTICLES

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## ABSTRACT

**Background:** Haemorrhoidal artery embolization (HAE) is a minimally invasive, vascular-targeted treatment intended to reduce arterial inflow to haemorrhoidal tissue while preserving anorectal anatomy. Evidence comparing embolic materials remains limited.

**Objective:** To assess the clinical outcomes of HAE in patients with Grade II or higher haemorrhoidal disease and compare outcomes following embolization with N-butyl cyanoacrylate (NBCA) and polyvinyl alcohol (PVA) particles.

**Methods:** This prospective study was conducted at NIMS Hospital and included 30 patients aged 18–65 years with Grade II–IV haemorrhoidal disease and rectal bleeding. Fifteen patients received NBCA and 15 received PVA particles. The source study gives conflicting descriptions of group allocation (operator discretion versus computer-generated stratified randomization), which must be resolved before the design can be accurately classified. Outcomes included symptom severity, quality of life (QoL), post-procedural pain, and recurrence at six months.

**Results:** The mean age was 41.43 ± 12.26 years and 56.7% of participants were male. Grade III disease was most common (50.0%), followed by Grade II (40.0%) and Grade IV (10.0%). At baseline, the mean symptom severity score was 7.43 ± 1.19, QoL score was 43.17 ± 10.02, haemorrhoidal bleeding score was 4.50 ± 1.14, and haemoglobin was 11.11 ± 1.38 g/dL. Mean pain score at six hours was 2.73 ± 1.05. At six months, the mean symptom severity score was 0.80 ± 0.81 and QoL score was 81.50 ± 7.49. Recurrence occurred in 3/30 patients (10.0%). Outcomes were numerically more favourable with NBCA than PVA: six-month symptom severity scores were 0.67 ± 0.72 versus 0.93 ± 0.88, QoL scores were 82.3 ± 7.1 versus 80.7 ± 7.9, and recurrence was 6.7% versus 13.3%, respectively.

**Conclusion:** HAE was associated with improved symptom scores and QoL, low early post-procedural pain, and a 10% recurrence rate at six months in this small cohort. Both embolic materials showed favourable outcomes; numerical differences favouring NBCA should be interpreted cautiously because inferential comparisons were not reported.

**KEYWORDS:** Haemorrhoidal Disease, Haemorrhoidal Artery Embolization, N-butyl Cyanoacrylate, Polyvinyl Alcohol, Quality of Life, Recurrence.

# Introduction

Haemorrhoidal disease is a common anorectal condition that can cause rectal bleeding, prolapse, irritation, discomfort, and impaired quality of life. Symptoms arise in association with enlargement and distal displacement of the anal cushions, involving vascular changes and deterioration of supporting connective tissue. Persistent bleeding may contribute to anaemia, while recurrent symptoms can affect daily activities and well-being[1,2].

Management is usually stepwise, beginning with dietary and lifestyle measures and progressing, when necessary, to office-based procedures or surgery. Current clinical guidance supports dietary fibre and behavioural modification as first-line measures, with office procedures and surgery selected according to symptom burden and disease grade[1]. Although established treatments are effective for many patients, post-procedural discomfort, recovery requirements, and recurrence remain relevant considerations.

Haemorrhoidal artery embolization (HAE), also described as rectal artery embolization (RAE) or the Emborrhoid technique, is an endovascular approach intended to reduce arterial inflow to the haemorrhoidal plexus. Angiographic guidance is used to identify and selectively treat feeding vessels, particularly branches of the superior rectal artery. Early clinical studies and reviews report technical feasibility and improvements in bleeding-related symptoms and quality of life, although the evidence base remains heterogeneous and includes relatively few controlled comparisons[3-7].

N-butyl cyanoacrylate (NBCA) is a liquid embolic agent that polymerizes to produce permanent occlusion, whereas polyvinyl alcohol (PVA) particles provide particle-based embolization. Their technical characteristics and risks differ, and material choice requires attention to vascular anatomy, catheter position, and avoidance of non-target embolization. Published RAE studies have used different embolic materials and procedural approaches, limiting direct comparison across studies[3,4,6,7].

This study assessed symptom control, quality of life (QoL), post-procedural pain, and six-month recurrence following HAE in patients with Grade II–IV haemorrhoidal disease. A secondary objective was to compare outcomes between patients treated with NBCA and those treated with PVA particles.

# Materials and Methods

## Study Design and Participants

This prospective study was conducted at NIMS Hospital. Thirty patients aged 18–65 years with Grade II, III, or IV haemorrhoidal disease presenting with rectal bleeding were included after providing written informed consent. Diagnosis and grading were established by clinical examination and proctoscopic evaluation performed by the operating surgeon.

Patients were excluded if they had anorectal malignancy, active local infection, a known allergy to iodinated contrast agents, or previous surgical intervention for haemorrhoidal disease.

## Intervention and Allocation

Digital subtraction angiography was used to delineate rectal arterial anatomy, followed by superselective catheterization using microcatheters. The source study describes both allocation according to vascular anatomy/operator discretion and a grade-stratified computer-generated randomization table. These descriptions are inconsistent; the actual allocation method must be confirmed from the original study records before submission. Until verified, this study should not be described definitively as randomized.

For NBCA embolization, NBCA was mixed with Lipiodol at ratios of 1:3 to 1:5. The microcatheter was flushed with 5% dextrose solution, and the mixture was injected slowly under fluoroscopic guidance, with care taken to avoid reflux. For PVA embolization, 300–500 μm particles were suspended in a 1:1 mixture of contrast medium and normal saline and injected under fluoroscopic surveillance until near-stasis and reduction or disappearance of the haemorrhoidal arterial blush.

## Outcomes and Follow-up

Outcomes recorded in the study included baseline haemorrhoidal bleeding score, symptom severity score, quality-of-life score, haemoglobin concentration, visual analogue scale (VAS) pain score at six hours, symptom severity and QoL scores at six months, and recurrence at six months. The source document did not provide the names or scoring ranges of the symptom and QoL instruments.

## Statistical Reporting

Continuous variables are presented as mean ± standard deviation and categorical variables as number and percentage, following the available results. The source report does not provide the statistical tests, confidence intervals, or p-values used to compare baseline and follow-up measurements or the two treatment groups. These analyses, along with the prespecified primary outcome and sample-size assumptions, should be verified and reported before submission.

# Results

## Participant Characteristics

Thirty participants were included, with 15 in each embolic-material group. The mean age was 41.43 ± 12.26 years, and 17 participants (56.7%) were male. Grade III haemorrhoids were present in 15 patients (50.0%), Grade II in 12 (40.0%), and Grade IV in 3 (10.0%). Baseline clinical measures indicated a substantial symptom burden and impaired QoL.

## Overall Clinical Outcomes

The mean VAS pain score at six hours was 2.73 ± 1.05. At six months, the mean symptom severity score was 0.80 ±


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0.81, compared with a baseline mean of 7.43 ± 1.19. The mean QoL score increased from 43.17 ± 10.02 at baseline to 81.50 ± 7.49 at six months. Recurrence was reported in three participants (10.0%), while 27 (90.0%) had no reported recurrence during the six-month follow-up.

## Comparison of NBCA and PVA particles

Baseline characteristics were broadly similar between the groups. At six hours, the mean VAS pain score was 2.53 ± 0.97 in the NBCA group and 2.93 ± 1.10 in the PVA group. At six months, symptom severity scores were 0.67 ± 0.72 and 0.93 ± 0.88, respectively, while QoL scores were 82.3 ± 7.1 and 80.7 ± 7.9. Recurrence occurred in one patient (6.7%) in the NBCA group and two patients (13.3%) in the PVA group. These descriptive differences favour NBCA numerically, but no statistical significance can be inferred from the available reporting.

**Table 1: Baseline characteristics and clinical status of participants (n = 30)**

| Variable | Result |
|---|---|
| Age, years (mean ± SD) | 41.43 ± 12.26 |
| Male, n (%) | 17 (56.7%) |
| Female, n (%) | 13 (43.3%) |
| Grade II haemorrhoids, n (%) | 12 (40.0%) |
| Grade III haemorrhoids, n (%) | 15 (50.0%) |
| Grade IV haemorrhoids, n (%) | 3 (10.0%) |
| Baseline bleeding score (mean ± SD) | 4.50 ± 1.14 |
| Baseline symptom severity score (mean ± SD) | 7.43 ± 1.19 |
| Baseline QoL score (mean ± SD) | 43.17 ± 10.02 |
| Baseline haemoglobin, g/dL (mean ± SD) | 11.11 ± 1.38 |

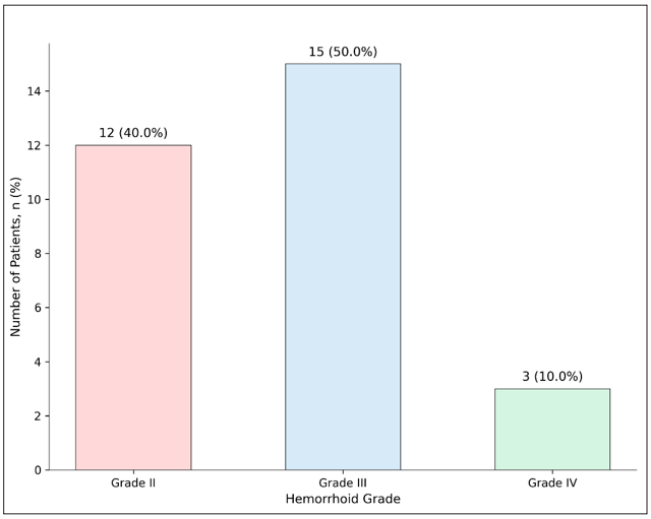



**Figure 1: Distribution of haemorrhoid grade among participants**

**Table 2: Overall outcomes following haemorrhoidal artery embolization**

| Outcome | Result |
|---|---|
| VAS pain score at 6 hours (mean ± SD) | 2.73 ± 1.05 |
| Symptom severity score at 6 months (mean ± SD) | 0.80 ± 0.81 |
| QoL score at 6 months (mean ± SD) | 81.50 ± 7.49 |
| No recurrence at 6 months, n (%) | 27 (90.0%) |
| Recurrence at 6 months, n (%) | 3 (10.0%) |

**Table 3: Six-month outcomes by embolic material**

| Outcome | PVA (n = 15) | NBCA (n = 15) |
|---|---|---|
| VAS pain score at 6 hours, mean ± SD | 2.93 ± 1.10 | 2.53 ± 0.97 |
| Symptom severity score at 6 months, mean ± SD | 0.93 ± 0.88 | 0.67 ± 0.72 |
| QoL score at 6 months, mean ± SD | 80.7 ± 7.9 | 82.3 ± 7.1 |
| Recurrence, n (%) | 2 (13.3%) | 1 (6.7%) |
| No recurrence, n (%) | 13 (86.7%) | 14 (93.3%) |

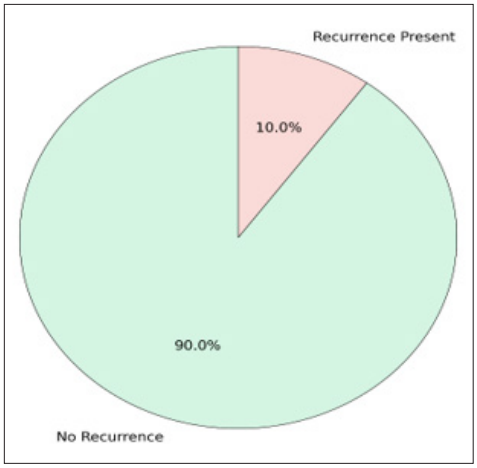



**Figure 2.Recurrence status at six-month follow-up**

## Discussion

In this prospective cohort of 30 patients with Grade II–IV haemorrhoidal disease, HAE was followed by lower symptom severity scores and higher QoL scores at six months. The overall recurrence proportion was 10%, and the mean pain score recorded six hours after the procedure was 2.73 ± 1.05. These findings are directionally consistent with published reports of symptom improvement after RAE, although published studies vary in selection criteria, embolic materials, outcome measures, and follow-up. [3–6] The small cohort and limited follow-up warrant cautious interpretation.

The participants had a mean age of 41.43 years and a modest male predominance. Half of the cohort had Grade III disease, while 40% had Grade II disease. This profile is consistent with the study's focus on patients with symptomatic, moderate-to-severe disease. Baseline bleeding and symptom severity scores were elevated, and the mean QoL score was relatively low, indicating that symptoms were affecting patients before intervention. The mean baseline haemoglobin of 11.11 g/dL may be compatible with chronic blood loss in some patients, although individual causes of anaemia cannot be determined from the reported data.

The reduction in mean symptom severity score from 7.43 at baseline to 0.80 at six months, alongside an increase in mean QoL score from 43.17 to 81.50, suggests a marked improvement in the measured outcomes after embolization. The results should not, however, be interpreted as proof of causal efficacy in the absence of a control group receiving an alternative treatment. The source document also does not report the specific score instruments, paired analyses, confidence intervals, or p-values, which limits assessment of the magnitude and precision of change.

The comparison of embolic materials showed numerically lower pain and symptom severity scores, a somewhat higher QoL score, and fewer recurrences in the NBCA group than in the PVA group. Recurrence was 6.7% with NBCA and 13.3% with PVA. These are descriptive differences only; with 15 participants per group and no reported inferential analysis, they do not establish superiority of NBCA. Existing RAE literature is heterogeneous, and systematic reviews have highlighted the need for more standardized outcomes and better comparative evidence[4–6,8].

The wider evidence base supports cautious interpretation. A Cochrane review concluded that the comparative benefits and harms of RAE remain uncertain because the available evidence is limited[9]. Technical reviews describe the importance of rectal arterial anatomy, selective catheterization, and careful embolic-agent delivery when minimizing non-target embolization risk[10]. Prospective work using detachable microcoils has reported technical feasibility and symptom improvement, but it evaluates a different embolic approach and cannot establish the relative effectiveness of NBCA and PVA[11]. A 2025 systematic review found generally favourable clinical outcomes across published studies but emphasized substantial variation in study designs, embolization techniques, outcome definitions, and follow-up[12]. The original description of the Emborrhoid technique and subsequent prospective studies using particles and coils also illustrate that outcomes depend on the treatment protocol and the population studied[13,14]. A meta-analysis of catheter-directed hemorrhoidal dearterialization further provides context for endovascular treatment, but pooled evidence from heterogeneous studies should not be taken as proof that one embolic material is superior[15].

## Limitations

The study was limited by its small sample size, single-centre setting, and six-month follow-up. The source report did not provide inferential statistics, confidence intervals, p-values, or complete definitions and scoring ranges for the symptom severity and QoL instruments. The allocation method is inconsistently described as both operator-discretion-based and computer-randomized and must be resolved. Detailed adverse-event data, participant flow/loss to follow-up, protocol registration, and a complete statistical analysis plan were not available in the supplied material. No comparator group receiving conservative treatment, an office-based procedure, or surgery was included. These limitations restrict generalizability and prevent firm conclusions about comparative superiority.

## Conclusion

In this prospective cohort, haemorrhoidal artery embolization was associated with lower symptom severity scores, improved QoL scores, low early post-procedural pain, and 10% recurrence at six months. Both NBCA and PVA particle embolization showed favourable descriptive outcomes. The NBCA group had numerically lower pain and symptom scores, a higher QoL score, and fewer recurrences, but the available data do not establish statistically significant differences. Larger, adequately powered studies with standardized outcome measures, explicit statistical analyses, adverse-event reporting, and longer follow-up are required to clarify the comparative effectiveness and safety of these embolic materials.

## Conflict of Interest

None

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