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ORIGINAL RESEARCH

STRUCTURAL

Transcatheter Repair in Posterior, Anterior, and Bileaflet Mitral Valve Disease

1-Year Results From EXPANDed

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ABSTRACT

BACKGROUND Treating anterior and bileaflet mitral valve disease in patients with primary or degenerative mitral regurgitation (DMR) is considered more challenging than posterior leaflet repair.

OBJECTIVES The aim of this analysis was to evaluate the impact of anterior, posterior, or bileaflet disease on outcomes following mitral transcatheter edge-to-edge repair (M-TEER) in the EXPANDed studies.

METHODS EXPANDed is a pooled, patient-level analysis of subjects undergoing M-TEER with the MitraClip G3 or G4 system as part of the contemporary EXPAND and EXPAND G4 studies. Subjects with DMR were categorized according to echocardiography core laboratory-assessed prolapse or flail location into posterior (prolapse or flail at P1, P2, and/or P3), anterior (prolapse or flail at A1, A2, and/or A3) or bileaflet disease (prolapse or flail at any combination of A1, A2, and A3 and P1, P2, and P3). Key outcomes assessed included procedural outcomes, 30-day major adverse events, and 1-year mitral regurgitation (MR) severity.

RESULTS Of 2,205 subjects in EXPANDed, 556 had echocardiography core laboratory-assessed DMR and prolapse or flail location. A total of 389 had posterior, 106 had anterior, and 61 had bileaflet disease. All groups experienced low device and procedure times with high procedural success rates (defined as discharge MR $\leq$2+). Thirty-day major adverse events rates were low across all groups (posterior, 4.4% [17 of 388]; anterior, 3.8% [4 of 105]; bileaflet, 6.6% [4 of 61]; $P = 0.65$). Through 1 year, all groups showed a significant reduction in MR severity from baseline (MR $\leq$1+ posterior, 82% [179 of 219]; anterior, 93% [53 of 57]; bileaflet, 97% [28 of 29]).

CONCLUSIONS Results from the EXPANDed studies demonstrate that subjects with DMR treated with M-TEER experienced significant improvements in outcomes, regardless of the location of prolapse or flail. (JACC Cardiovasc Interv. 2025;18:898–908) © 2025 The Authors. Published by Elsevier on behalf of the American College of Cardiology Foundation. This is an open access article under the CC BY license (http://creativecommons.org/licenses/by/4.0/).

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Primary mitral regurgitation (or degenerative mitral regurgitation [DMR]) is a degenerative valvular heart disease caused by structural and mechanical alterations in the mitral valve (MV) apparatus that leads to inadequate leaflet coaptation.[1-3] The MV apparatus comprises the annulus, chordae tendineae, papillary muscles, and anterior and posterior leaflets. Each leaflet is divided into segments, namely, lateral (A1 and P1), central (A2 and P2), and medial (A3 and P3), where A refers to the anterior and P refers to the posterior leaflet.[4-6] MV prolapse (MVP) and MV flail (MVF) are common causes of DMR. MVP is characterized by the bulging of the MV leaflets into the left atrium during systole, and MVF is characterized by the abnormal movement of the MV leaflets into the left atrium due to ruptured chordae tendineae or papillary muscles.[7] MVP and MVF can affect either individual valve segments of the posterior and anterior leaflets or involve all segments, with the posterior leaflet being the most common lesion location.[8-10]

Surgical MV repair is the guideline-recommended treatment for patients with DMR.[11] Although surgical repair of the posterior leaflet is well established and associated with excellent long-term outcomes, the repair of anterior and bileaflet disease has historically yielded inferior results.[12-18] The larger size and greater mobility of the anterior leaflet, and the involvement of both leaflets in bileaflet prolapse, increase the difficulty of achieving a durable surgical repair in these anatomies. However, with advances in technologies and experience, the outcomes for anterior and bileaflet repair are becoming more comparable with those of posterior leaflet repair.[15,19-26]

Mitral transcatheter edge-to-edge repair (M-TEER) with the MitraClip system (Abbott) is a safe and effective treatment option for high-risk patients with DMR.[27] The introduction of newer generations of the MitraClip system has allowed tailored treatment for complex anatomies, including anterior and bileaflet disease.[28-30] However, the influence of the leaflet flail or prolapse location on patients with DMR undergoing M-TEER remains unknown. The aim of this analysis was to evaluate the impact of anterior, posterior, or bileaflet disease on outcomes of subjects with DMR treated with M-TEER, on the basis of data from the EXPANDed studies.

METHODS

STUDY DESIGN AND SUBJECT COHORT. The EXPAND and EXPAND G4 studies were global, prospective, multicenter, contemporary, single-arm studies initiated to evaluate the safety and effectiveness of the third- and fourth-generation MitraClip systems, respectively. The EXPANDed cohort represents a pooled, patient-level analysis of the EXPAND and EXPAND G4 studies of 2,205 subjects with symptomatic moderate to severe and severe DMR or secondary mitral regurgitation (MR). Subjects were enrolled across 91 centers in the United States, Europe, Canada, Israel, Saudi Arabia, and Japan from 2018 to 2022. All participants provided written informed consent and met eligibility criteria based on the study protocols and local recommendations. Subjects were followed up at discharge, 30 days, and 1 year postprocedure. The studies received regulatory approval from relevant Institutional Review Boards or ethics committees and national competent authorities as applicable per country requirements. These studies adhere to good clinical practice standards outlined in the Declaration of Helsinki. Further study details have been previously published.[28,29] The studies are registered at ClinicalTrials.gov (EXPAND, NCT03502811; EXPAND G4, NCT04177394).

ECHOCARDIOGRAPHIC AND CLINICAL OUTCOMES ASSESSMENT. Transthoracic echocardiography (TTE) and transesophageal echocardiography (TEE) were performed at baseline and follow-up time points. Two independent echocardiography core laboratories (ECLs) retrospectively assessed echocardiograms. Medical Research Development and the MedStar Health Research Institute evaluated MV anatomical characterization and left ventricular parameters for the EXPAND and EXPAND G4 cohorts, respectively. The MedStar Health Research Institute assessed the MR severity and etiology of all EXPANDed subjects by following the American Society of Echocardiography guidelines.[31] MR severity assessments were performed using a previously published multiparametric algorithm adapted from the criteria recommended by American Society of Echocardiography guidelines.[31,32]

ABBREVIATIONS AND ACRONYMS

DMR = degenerative mitral regurgitation

ECL = echocardiographic core laboratory

HF = heart failure

HFH = heart failure hospitalization

MAE = major adverse event(s)

MR = mitral regurgitation

M-TEER = mitral transcatheter edge-to-edge repair

MV = mitral valve

MVF = mitral valve flail

MVP = mitral valve prolapse

SAM = systolic anterior motion

TEE = transesophageal echocardiography

TTE = transthoracic echocardiography

The authors attest they are in compliance with human studies committees and animal welfare regulations of the authors' institutions and Food and Drug Administration guidelines, including patient consent where appropriate. For more information, visit the Author Center.

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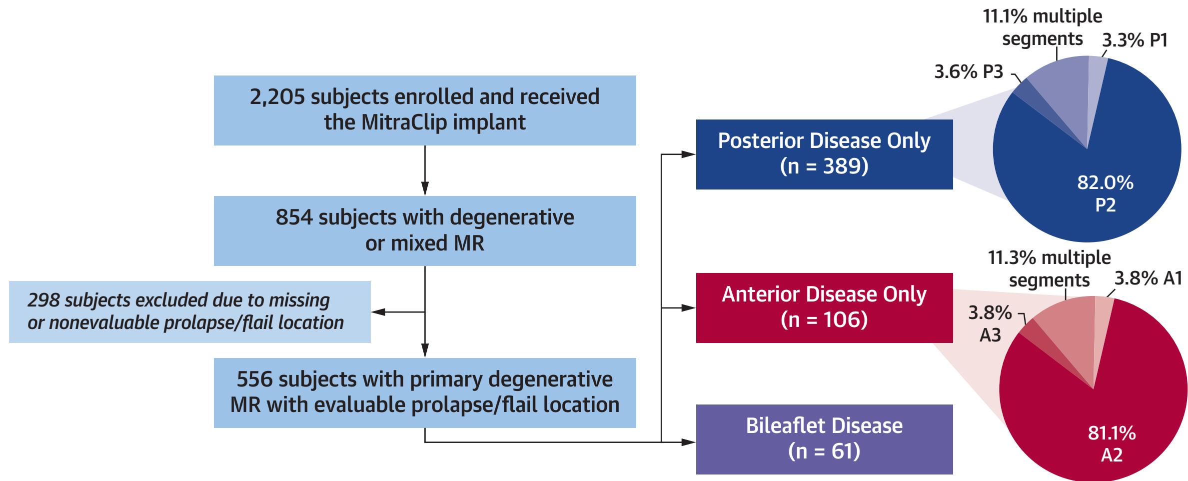
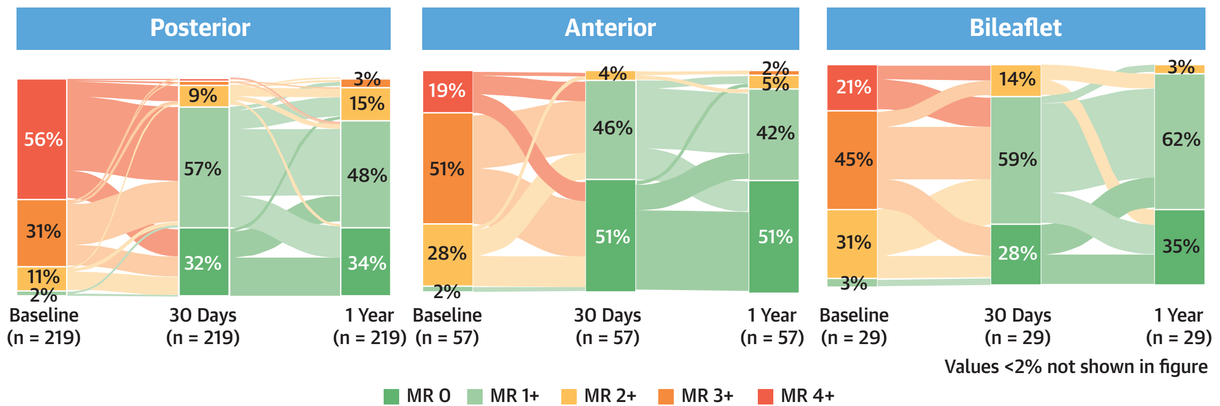
CENTRAL ILLUSTRATION Study Overview and Findings

M-TEER in Posterior, Anterior, and Bileaflet Disease: 1-Year EXPANDed Results by Mitral Leaflet Lesion Location

A Study Population in EXPANDed by Disease Location



B Reduction of Mitral Regurgitation Following Mitral TEER



- Assessed by an echocardiographic core laboratory, 70%, 19%, and 11% in EXPANDed had posterior, anterior, and bileaflet mitral disease, respectively
- 30-day major adverse events were low and similar at 4.4%, 3.8%, and 6.6%, respectively
- At 1 year, MR ≤1+ was present in 82%, 93%, and 97%, respectively

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Breakdown of lesion location (A) and 1-year mitral regurgitation (MR) severity following mitral transcatheter edge-to-edge repair (M-TEER) (paired analysis shown) (B) for patients in the EXPANDed studies.

MR severity was measured at baseline, 30-day, and 1-year visits.

Acute procedural success was defined as achieving a residual MR grade of 2+ or less at the time of discharge. Major adverse events (MAE) were defined as death, myocardial infarction, stroke, MV replacement, single-leaflet device attachment, and device embolization. Death, myocardial infarction, and stroke were adjudicated by a clinical events adjudication committee. Device-related complications such as single-leaflet device attachment, device-related embolization, and the need for surgical MV replacement through 1 year were assessed and adjudicated by an independent physician committee.

ANALYSIS POPULATION. Subjects were stratified into 3 groups: 1) posterior only (prolapse or flail at P1, P2, and/or P3); 2) anterior only (prolapse or flail at A1, A2, and/or A3); and 3) bileaflet (prolapse or flail at any combination of A1, A2, and A3 and P1, P2, and P3). For inclusion in the analysis population, the ECL must have identified the location of the flail or prolapse on the posterior and/or anterior leaflets (A1, A2, A3, P1, P2, and/or P3) via TEE. Subjects without ECL-assessed flail of prolapse location were excluded.

STATISTICAL ANALYSIS. The statistical analysis for this study was defined after data were collected from EXPAND and EXPAND G4 studies. For each subgroup, categorical data are presented as proportions and continuous data as mean ± SD. Comparisons were reported using the Fisher exact test, chi-square test, or analysis of variance. Paired nominal data were analyzed using the McNemar-Bowker test. Student's *t*-test was used to compare paired continuous variables. Analysis of variance or the Kruskal-Wallis test was used for nonparametric data. Tukey's honestly significant difference method was used to adjust for

TABLE 1 Baseline Demographics and Medical History

	Posterior Only (n = 389)	Anterior Only (n = 106)	Bileaflet (n = 61)	*P* Value
Age, y	81.1 ± 8.1	79.0 ± 8.1	79.2 ± 7.3	0.02
Female	45.0 (175/389)	40.6 (43/106)	55.7 (34/61)	0.16
STS repair score	4.8 ± 4.1 (233)	5.3 ± 4.6 (68)	4.8 ± 4.2 (48)	0.71
Atrial fibrillation	50.9 (196/385)	67.9 (72/106)	67.2 (41/61)	0.001
Prior cardiac surgery	12.3 (48/389)	17.9 (19/106)	8.2 (5/61)	0.16
Prior heart failure hospitalization within 1 y	31.5 (115/365)	45.9 (45/98)	32.8 (19/58)	0.03
Hypertension	73.8 (287/389)	83.0 (88/106)	60.7 (37/61)	0.006

Values are mean ± SD or % (n/N). Statistical significance was determined using analysis of variance for continuous variables and the chi-square test for categorical variables. Unless otherwise stated, all patients had variable data reported.

STS = Society for Thoracic Surgeons.

TABLE 2 Baseline Echocardiographic Characteristics

	Posterior (n = 389)	Anterior (n = 106)	Bileaflet (n = 61)	*P* Value
Flail only	67.6 (263/389)	57.5 (61/106)	1.6 (1/61)	<0.0001
Prolapse only	28.0 (109/389)	39.6 (42/106)	98.4 (60/61)	<0.0001
Flail and prolapse	4.4 (17/389)	2.8 (3/106)	0.0 (0/61)	0.23
Complex anatomy	23.6 (91/386)	15.1 (16/106)	83.6 (51/61)	<0.0001
Primary jet outside A2/P2	6.5 (25/386)	2.8 (3/106)	4.9 (3/61)	0.34
Presence of more than one significant jet	1.3 (5/386)	0.0 (0/106)	1.6 (1/61)	0.47
Severely degenerative leaflets or wide flail gaps/widths	13.0 (50/386)	10.4 (11/106)	42.6 (26/61)	<0.0001
Presence of wide jet	4.9 (19/386)	2.8 (3/106)	9.8 (6/61)	0.13
Presence of significant cleft	0.3 (1/374)	0.0 (0/103)	0.0 (0/61)	0.80
Bileaflet flail/prolapse	2.9 (11/382)	1.9 (2/104)	75.4 (46/61)	<0.0001
Small valve	0.3 (1/386)	0.9 (1/106)	0.0 (0/61)	0.51
Calcified landing zone	2.6 (10/386)	1.9 (2/106)	0.0 (0/61)	0.42
Minimal leaflet tissue for attachment	1.0 (4/386)	0.0 (0/106)	0.0 (0/61)	0.42
LVEF, %	61.7 ± 10.1 (268)	59.6 ± 10.2 (76)	56.7 ± 10.0 (41)	0.008
LVEDV, mL	116.2 ± 42.4 (269)	126.6 ± 54.3 (77)	102.6 ± 38.2 (44)	0.02
LVESV, mL	45.6 ± 25.6 (272)	52.8 ± 33.6 (76)	45.2 ± 20.8 (41)	0.11
LVEDD, cm	5.1 ± 0.7 (337)	5.2 ± 0.7 (95)	4.8 ± 0.7 (56)	0.0009
LVESD, cm	3.4 ± 0.8 (329)	3.6 ± 0.8 (91)	3.3 ± 0.6 (52)	0.02

Values are % (n/N) or mean ± SD (n). Statistical significance was determined using analysis of variance for continuous variables and the chi-square for categorical variables. Unless otherwise stated, all patients had variable data reported.

LVEDD = left ventricular end-diastolic diameter; LVEDV = left ventricular end-diastolic volume; LVEF = left ventricular ejection fraction; LVESD = left ventricular end-systolic diameter; LVESV = left ventricular end-systolic volume.

TABLE 3 Procedural Characteristics

	Posterior Only (n = 389)	Anterior Only (n = 106)	Bileaflet (n = 61)	*P* Value
% treated with MitraClip G4[a]	68.6 (275/389)	70.7 (77/106)	100.0 (61/61)	NA
Procedure duration, min	83.3 ± 41.2	81.7 ± 38.1	84.0 ± 35.0	0.51
Device time, min	45.7 ± 31.7 (388)	44.8 ± 32.8 (105)	42.2 ± 28.3 (60)	0.75
Implanted clips per patient	1.5 ± 0.6	1.5 ± 0.5	1.4 ± 0.6	0.60
Acute procedural success	94.8 (367/387)	98.1 (104/106)	91.8 (56/61)	0.17

Values are % (n/N) or mean ± SD (n). Statistical significance was determined using analysis of variance for continuous variables and the chi-square for categorical variables. Unless otherwise stated, all patients had variable data reported. [a]Indicates the proportion of patients treated with the MitraClip G4 System in each group.

NA = not applicable.

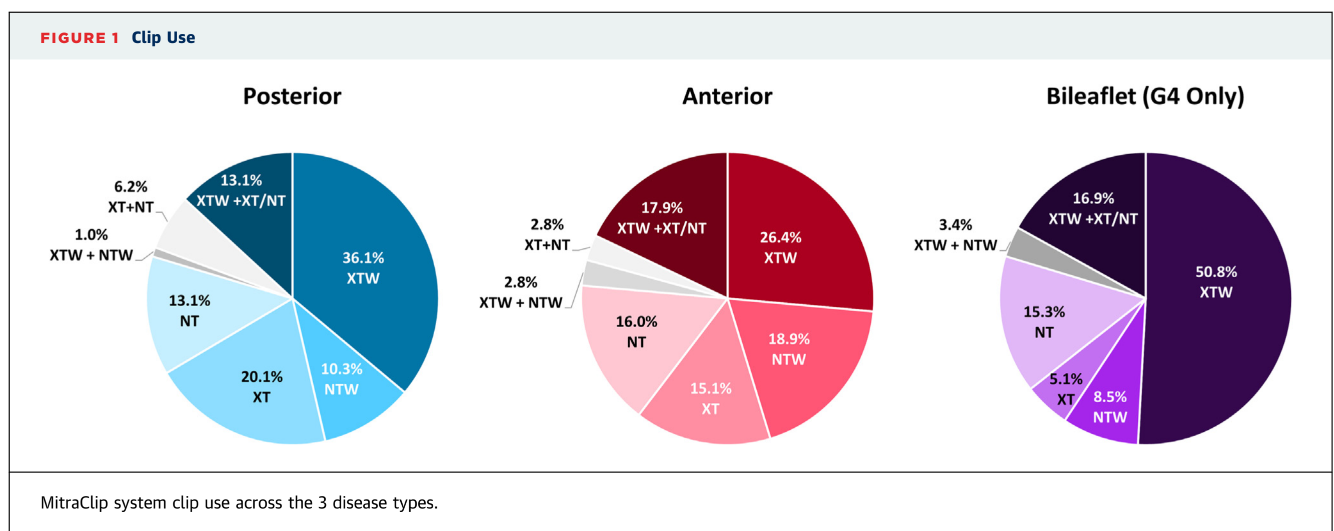
multiple comparisons. In this study, the occurrence of MAEs and device-related complications was documented through 1 year in subjects who experienced adverse events or remained in the study until reaching the lower limit of the visit window. Subjects' data were considered up to their most recent event-free date. Statistical significance was attributed to 2-sided *P* values <0.05. Data were analyzed using SAS version 9.4 (SAS Institute).

RESULTS

STUDY POPULATION. Of the 2,205 subjects in EXPANDed, 854 had ECL-assessed primary or mixed MR. Of all subjects with DMR or mixed MR, 556 had ECL-assessed prolapse or flail location at baseline. Of 556 subjects, 389 (70.0%) subjects had posterior prolapse or flail only (posterior group), 106 (19.1%) had anterior prolapse or flail only (anterior group), and 61 (11.0%) had bileaflet prolapse or flail (bileaflet group). Most subjects in both the posterior and anterior groups had central prolapse or flail locations at P2 and A2, respectively (posterior: P1 flail or prolapse, 3.3% [13 of 389]; P2, 82.0% [319 of 389]; P3, 3.6% [14 of 389]; multiple segments, 11.1% [43 of 389]; anterior: A1 flail or prolapse, 3.8% [4 of 389]; A2, 81.1% [86 of 106]; A3, 3.8% [4 of 106]; multiple segments, 11.3% [12 of 106]) (Central Illustration A). A total of 289 subjects were excluded from the analysis because of missing or absence of a clear and identifiable ECL-assessed flail or prolapse location.

BASELINE CHARACTERISTICS. Subjects in the posterior group were often older than those in the anterior and bileaflet groups, had a lower occurrence of atrial fibrillation, and had better left ventricular function. Subjects in the anterior group had the highest occurrence of prior heart failure hospitalization (HFH) within 1 year and the largest left ventricular volumes and dimensions. By definition of

FIGURE 1 Clip Use



MitraClip system clip use across the 3 disease types.

TABLE 4 Major Adverse Events Through 30 Days

	Posterior Only (n = 389)	Anterior Only (n = 106)	Bileaflet (n = 61)
30-d composite MAE rate[a]	4.4 [2.6-6.9] (17/388)	3.8 [1.1-9.5] (4/105)	6.6 [1.8-16.0] (4/61)
Death	1.3 [0.4-3.0] (5/388)	1.9 [0.2-6.7] (2/105)	4.9 [1.0-13.7] (3/61)
Myocardial infarction	0.5 [0.1-1.9] (2/388)	0.0 [0-3.5] (0/105)	0.0 [0.0-5.9] (0/61)
Stroke	0.8 [0.2-2.2] (3/388)	0.0 [0.0-3.5] (0/105)	0.0 [0.0-5.9] (0/61)
Mitral valve replacement	0.5 [0.1-1.9] (2/388)	0.0 [0.0-3.5] (0/105)	0.0 [0.0-5.9] (0/61)
SLDA	1.5 [0.6-3.3] (6/388)	1.9 [0.2-6.7] (2/105)	1.6 [0.0-8.8] (1/61)
Embolization	0.9 [0.0-4.8] (1/114)	0.0 [0.0-12.3] (0/28)	NA

Values are % [95% CI] (n/N). [a]No significant difference in composite MAE rate among groups ($P = 0.65$).
MAE = major adverse event(s); NA = not applicable (missing data); SLDA = single-leaflet device attachment.

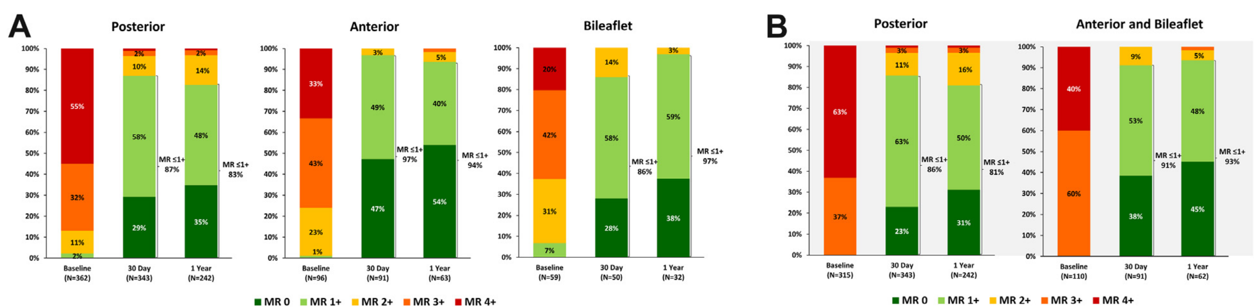
complex anatomy,[28] subjects in the bileaflet group exhibited the highest rates of anatomical complexity. However, subjects in the posterior and anterior groups also represented populations with a notable proportion of complex anatomy. Other baseline characteristics were not significantly different among groups (Tables 1 and 2).

PROCEDURAL AND SAFETY OUTCOMES. Regardless of lesion location, subjects experienced low device and procedure times, with a high rate of procedural success, defined as MR ≤2+ at discharge. The mean number of clips implanted was similar across all groups. Most subjects in the posterior and anterior groups were treated with the MitraClip G4 system (Table 3). Wide and/or long clips were used most often regardless of lesion location, and there were 8 different clip combinations across 4 clip sizes for tailored treatment (Figure 1). The 30-day MAE rate was low regardless of lesion location (posterior, 4.4% [17 of 388]; anterior, 3.8% [4 of 105]; bileaflet, 6.6% [4 of 61]) and not significantly different among groups (Table 4). There were no significant differences among the groups for 30-day MAE.

ECHOCARDIOGRAPHIC OUTCOMES. MR severity was significantly reduced to MR ≤1+ regardless of lesion location at 30 days (paired 30-day MR ≤1+: posterior, 89% [195 of 219]; anterior, 96% [55 of 57]; bileaflet, 86% [25 of 29]; $P = 0.18$ vs baseline) and 1 year (paired 1-year MR ≤1+: posterior, 82% [179 of 219]; anterior, 93% [53 of 57]; bileaflet, 97% [28 of 29]; $P = 0.02$ vs baseline) (Central Illustration B; unpaired analysis in Figure 2A). Consistent with the full cohort results, reduction of MR severity for subjects with only severe MR (MR ≥3+) at baseline was comparable between the posterior and combined anterior and bileaflet groups (Figure 2B).

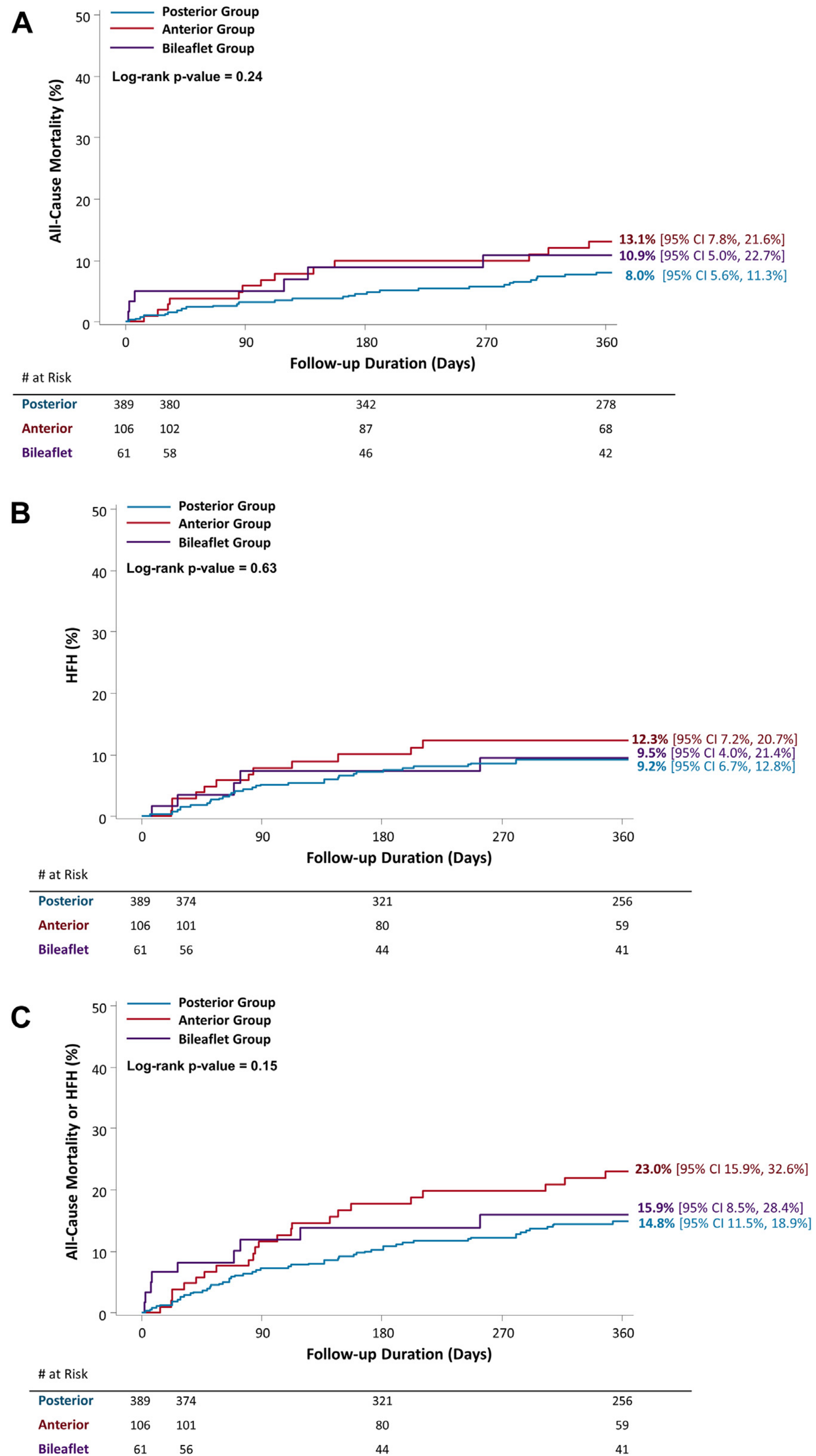
CLINICAL OUTCOMES. All-cause mortality and HFH. There was no statistically significant difference in composite all-cause mortality rate or HFH rate among groups, although rates in the anterior group were numerically higher (posterior, 14.8%; anterior,

FIGURE 2 MR Severity Through 1 Year for Full Cohort and by Baseline MR (Unpaired Analysis)



Mitral regurgitation (MR) severity on the basis of lesion location for patients in the EXPANDed studies (A) and by baseline mitral regurgitation of 3+ or 4+ only (B).

FIGURE 3 All-Cause Mortality, Heart Failure Hospitalization, and Composite Through 1 Year

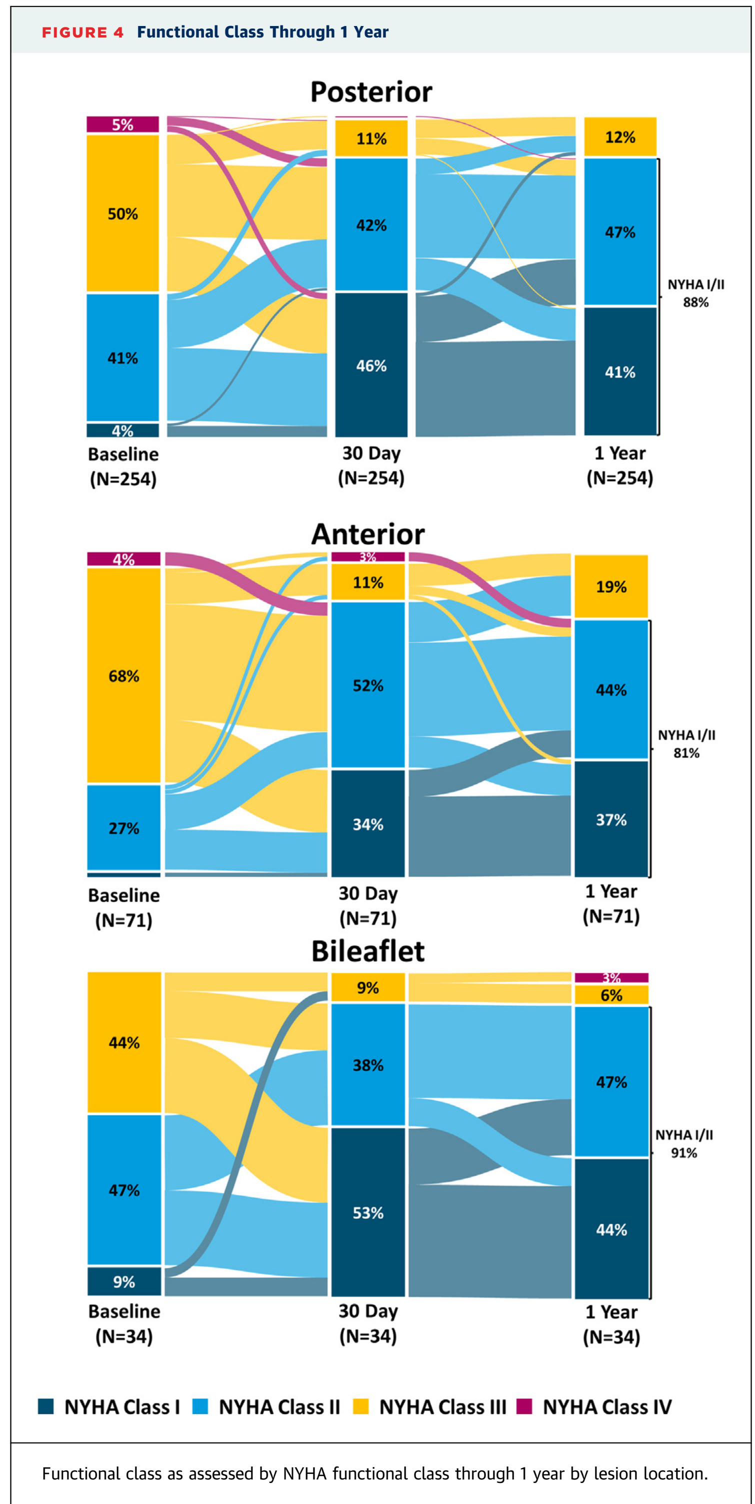


All-cause mortality (A), heart failure hospitalization (HFH) (B), and composite of all-cause mortality or HFH (C) through 1 year by lesion location. Statistical significance was determined using the log-rank test.

23.0%; bileaflet, 15.9%; $P = 0.15$). This finding was consistent when outcomes were described for all-cause mortality alone (posterior, 8.0%; anterior, 13.1%; bileaflet, 10.9%; $P = 0.24$) and HFH alone (posterior, 9.2%; anterior, 12.3%; bileaflet, 9.5%; $P = 0.63$), with no significant differences among groups (Figure 3).

Functional capacity and quality of life. Through 1 year, subjects experienced significant improvements in NYHA functional class from baseline regardless of lesion location (1-year NYHA functional class ≤II: posterior, 88% [223 of 254]; anterior, 81% [57 of 71]; bileaflet, 91% [31 of 34]) (Figure 4). Similarly, subjects in all 3 groups experienced substantial improvement in quality of life from baseline to 1 year (change in Kansas City Cardiomyopathy Questionnaire score, posterior, 15.4 [2.1-32.3]; anterior, 22.7 [8.8-36.6]; bileaflet, 19.0 [5.3-32.3]) (Figure 5).

FIGURE 4 Functional Class Through 1 Year



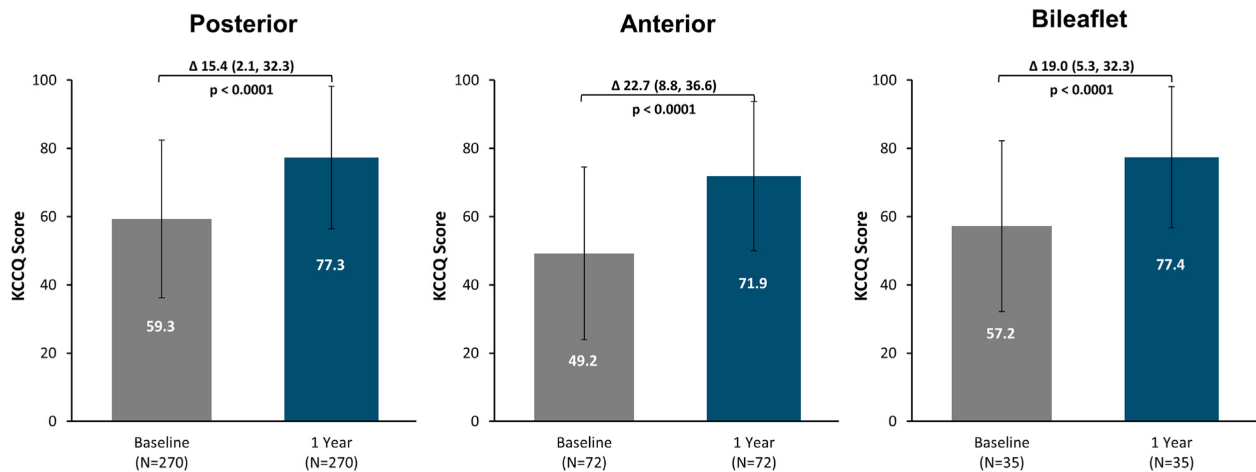
Functional class as assessed by NYHA functional class through 1 year by lesion location.

DISCUSSION

In this analysis, we explored the impact of anterior, posterior, and bileaflet disease on clinical outcomes of subjects with DMR following M-TEER with the MitraClip system. Regardless of lesion location, subjects experienced significant MR reduction through 1 year. Similarly, no significant differences were observed among groups for 30-day MAE and 1-year all-cause mortality, HFH, and composite all-cause mortality or HFH. Improvements in functional capacity and quality of life were comparable across groups. These results demonstrate that subjects with DMR treated with M-TEER using the MitraClip device in the EXPANDed studies experienced significant clinical benefit, regardless of the location of prolapse or flail.

Historically, lesions located in the anterior and bileaflet locations have been considered difficult to treat surgically.[12-18] Contemporary M-TEER technologies allow an adequate reduction in MR severity and associated functional improvements despite anatomical challenges. As M-TEER therapies mature, more patients with complex anatomies are undergoing M-TEER. In the PASCAL IID registry, severe bileaflet or multiscallop prolapse involvement in MR was observed in 15.0% of cases considered anatomically complex.[33] In the EXPANDed data set, bileaflet lesion locations accounted for 11% of subjects with DMR or mixed MR. Despite the anatomical complexities in these subjects, a high proportion achieved MR of 1+ or less at 1 year (97%) following M-TEER with the MitraClip G4 system. Design improvements of the latest MitraClip generation, such as the availability of larger clip sizes, as well as increased operator experience and improved imaging technology, may contribute to the prevalence and success of treating complex anatomies with M-TEER.[29] Approximately one-half of the subjects with bileaflet disease received XTW clips alone, while about 20% had XTW

FIGURE 5 Quality of Life Through 1 Year



Quality of life as assessed by Kansas City Cardiomyopathy Questionnaire (KCCQ) overall summary score through 1 year by lesion location. Paired analysis is shown. Statistical significance was determined using Student's *t*-test. Data are expressed as median (Q1-Q3).

clips deployed alongside NTW or XT/NT clips. The preference for XTW use in these subjects is unsurprising given its wider, longer clip design, which allows adequate grasp and restored coaptation of the leaflets. No significant differences were observed in procedural characteristics among groups, including access site and procedure duration, indicating that procedural efficiency is not affected by lesion location.

Regardless of DMR flail or prolapse location, subjects treated with M-TEER experienced improvements in functional class by NYHA functional class and quality of life by Kansas City Cardiomyopathy Questionnaire. In particular, those with anterior leaflet disease had the lowest baseline Kansas City Cardiomyopathy Questionnaire scores and the highest proportion of subjects in NYHA functional class III or IV at baseline, yet 1-year improvements in both measures were similar to those among subjects with posterior or bileaflet disease following M-TEER. Similar trends were observed for all-cause mortality, HFH, and the composite through 1 year. Similar contemporary clinical outcomes have been reported for surgical repair.[21] Although anterior and bileaflet disease is historically more anatomically complex to repair, these challenges appear to be mitigated with advances in both surgery and M-TEER techniques. Mortality and functional outcomes are improved following a successful repair procedure with a significant and sustained reduction in MR.

M-TEER does offer some technical advantages over surgical MV repair. Studies have reported a systolic anterior motion (SAM) incidence of 10% in patients undergoing surgical repair,[34] often requiring surgical edge-to-edge repair.[35,36] M-TEER can prevent or treat severe SAM of the MV.[37,38] This might have therapeutic implications when choosing between surgical MV repair and M-TEER in patients with bulky, elongated anterior and posterior leaflets, who are at higher risk for developing SAM following surgical MV repair. There are 2 ongoing prospective randomized trials (REPAIR MR, NCT04198870; PRIMARY [Percutaneous or Surgical Repair in Mitral Prolapse and Regurgitation for ≥60 Year-Olds], NCT05051033) comparing contemporary surgical MV repair with M-TEER in lower risk patients with DMR.[39] The encouraging results of this analysis further support the need and timing of these 2 trials.

STUDY LIMITATIONS. In the EXPANDed registry, all patients were enrolled on the basis of the site's analysis, not following a prospective core laboratory assessment of MR severity. Each site assessed the appropriateness of treatment on the basis of a cumulative assessment of clinical findings, TTE, and TEE. The core laboratory performed a retrospective analysis of TTE only for severity and TEE for morphology. It is well known that the severity of MR may be underestimated by TTE only. Several factors, including poor acoustic windows, body habitus, and

eccentric, commissural MR jets, can lead to an underestimation of severity. This represents a limitation as well as a strength, as in a real-world clinical practice, the appropriateness of therapy is based on the analysis of clinical and imaging studies, not just 1 imaging modality. We accounted for the discordance by excluding subjects with DMR with ECL-assessed MR ≤2+ at baseline when comparing MR severity assessments through 1 year (**Figure 2**).

The second limitation of this study is that the follow-up period was limited to 1 year. Third, the results of this study may not apply to all types of DMR. Although the EXPANDed studies were all comers, certain patients may have been excluded on the basis of the operator's clinical judgment.

CONCLUSIONS

In the EXPANDed data set, subjects with severe DMR originating across all locations of flail or prolapse (posterior, anterior, and bileaflet) treated with M-TEER experienced significantly reduced MR severity through 1 year and improved quality of life and functional capacity. No significant differences in MAE at 30 days, mortality, or HFH rates were observed among groups, suggesting that although anterior and bileaflet disease may be more anatomically complex and historically more difficult to treat surgically, M-TEER with the MitraClip provides an effective treatment option for patients with DMR. These encouraging results will be verified in the 2 randomized clinical trials comparing contemporary surgical repair with M-TEER in lower-risk patients with.[39]

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PERSPECTIVES

WHAT IS KNOWN? Surgical repair of anterior and bileaflet disease for DMR has historically yielded inferior results compared with posterior leaflet repair. How anterior and bileaflet anatomies affect outcomes among patients treated with M-TEER is understudied.

WHAT IS NEW? In a retrospective analysis of the contemporary EXPANDed cohort in patients with DMR, anterior or bileaflet disease did not affect procedural success, MR reduction, mortality, or MAE rates following treatment with M-TEER.

WHAT IS NEXT? Although M-TEER is safe and effective in a postmarket setting, a direct comparison of anterior vs posterior disease treatment with contemporary surgical repair vs M-TEER should be assessed in the 2 ongoing randomized control trials.

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