

Efficacy of Coronary Stenting Versus Balloon Angioplasty in Small Coronary Arteries

ASAD KHAN¹, MUHAMMAD SHAHAB UDDIN KHALIL², ABDUL LATIF³, MUZDALFA PARVEZ⁴, ZARMINA IKRAM⁵

¹Medical Officer, Department of Cardiology, DHQ Hospital Alpurai, Shangla

²Interventional Cardiology Fellow, Department of Interventional Cardiology, MTI - Medical Complex, Peshawar

³Interventional Cardiology Fellow, Department of Interventional Cardiology, MTI - Hayatabad Medical Complex, Peshawar

⁴Post Graduate Resident Cardiology, MTI - Hayat Abad Medical Complex, Peshawar

⁵House Officer, Mercy Teaching Hospital, Peshawar

Corresponding author: Abdul Latif, Email: abdullateyf189@hotmail.com

ABSTRACT

Background and aim: The most common approach of percutaneous myocardial revascularization is stent placement. In de novo focal lesions found in big native arteries, balloon angioplasty had lower efficacy than coronary stenting. However, the usefulness of stenting in small arteries remains debatable. The purpose study aimed to compare the efficacy of coronary stenting vs. balloon angioplasty in small coronary arteries.

Patients and Method: This comparative study was carried out on 132 patients with lesion in small coronary arteries (reference diameter <3mm) in the department of Interventional Cardiology, MTI- Hayat Abad Medical Complex, Peshawar from 16th January 2021 to 15th July 2022. Patients were arbitrarily assigned to stent implantation and standard balloon angioplasty. Study protocol was approved by research and ethical committee. Each individual provided written informed consent. The rates of clinical event were evaluated within 1 year. Descriptive statistics was carried out in SPSS version 26.

Results: Of the total patients, there were 80 (60.6%) male and 52 (39.4%) were females. Both groups were assigned 66 patients and had similar baseline characteristics and angiography data. Based on treatment analysis, the major adverse cardiac events (MACEs) and angiographic success rate were similar: 5.2% and 96.8% in coronary stenting versus 5.9% and 92.4% in balloon angioplasty group respectively. About 4.2% patients underwent abrupt closure changes within 30 days. Stenting conveyed the substantially larger lumen (1.52 mm vs. 1.32 mm, $p < 0.001$) at 6 months and larger post-procedural lumen diameter (2.31 vs. 1.82 mm, $p < 0.001$) as compared to balloon angioplasty. The incidence of restenosis was found 36% and 56% in coronary stenting and balloon angioplasty respectively. The survival rate (event-free) was achieved in 79% and 69% ($p = 0.021$) in coronary stenting and angioplasty respectively.

Conclusion: The present study found that optimum balloon angioplasty with preliminary stenting may be a viable therapeutic option for small coronary arteries lesions. Restenosis was found to be 36% and 56% in coronary stenting and balloon angioplasty, respectively.

Keywords: Restenosis, Small coronary arteries, Balloon angioplasty, Coronary stenting

INTRODUCTION

Stent implantation is a commonplace procedure in interventional cardiology and has been gradually increased with advancement in clinical controlled trial and management. Regardless of restenosis increased risk, standard balloon angioplasty remains a major issue in small coronary arteries [1-4]. Numerous studies have been conducted to investigate the effectiveness of elective stent implantation for small coronary artery lesions and reported diverse outcomes [5, 6]. The debate is still ongoing regarding whether stents should be simply implanted for unsatisfactory outcomes or small coronary disease main treatment. Coronary stents enable a more severe balloon dilation technique, and as a result, the balloon angioplasty procedural outcomes have been substantially improved in the era of stent implantation. Currently, the balloon angioplasty optimum outcomes in stent implantation has been proposed as a viable technique to improving the primary angioplasty long-term result [7, 8].

The findings of two major randomized trials [9, 10] establish that elective stent insertion is better for new pathological changes in balloon angioplasty for large coronary arteries (.3 mm). Though, nearly one-third of lesions in current practice are situated in narrow (3 mm) coronary arteries, [11, 12] a status associated with poor prognosis after balloon angioplasty [13]. Numerous studies proposed that coronary stenting in narrow arteries may result in improved clinical outcomes and restenosis lower rates compared to balloon angioplasty [14]. However, there is paucity of data on the comparison of efficacy of coronary stenting and balloon angioplasty for small arteries disease the treatment. Therefore, this comparative study was conducted to determine the efficacy of coronary stenting versus balloon angioplasty in small coronary arteries.

METHODOLOGY

This comparative study was carried out on 132 patients with lesion in small coronary arteries (reference diameter <3mm) in the

department of Interventional Cardiology, MTI- Hayat Abad Medical Complex, Peshawar from 16th January 2021 to 15th July 2022. Patients were arbitrarily assigned to stent implantation and standard balloon angioplasty. Patients were arbitrarily assigned to stent implantation and standard balloon angioplasty. Study protocol was approved by research and ethical committee. Each individual provided written informed consent. The rates of clinical event were evaluated within 1 year. Ischemic heart symptomatic patients (myocardial ischemia, angina pectoris, or both) with de novo lesions in small coronary arteries were enrolled. Femoral approach was followed for performing the procedure with introduction of arterial having 6F to 8F size. Before the surgery, each individual received a heparin bolus (80 U/kg), which was ultimately added according to standard procedure. Aspirin was given to the majority of the patients (160 to 325 mg daily). In other situations, 500 mg of aspirin was given intravenously prior to the treatment. Aspirin 100 mg dosage was administrated in patients allocated for stent implantation on daily basis. In all cases, the Bestent Small was employed, which is designed for 2.5- to 3.0-mm-diameter vessels. Before stenting, each lesion was predilated using a 20-mm-long 2.5-mm or noncompliant 2.75-mm balloon. The balloon size was chosen to achieve a balloon-to-artery ratio close to one. For PTCA, similar balloons were utilized. A visual assessment of an ideal angiographic outcome was a residual stenosis of 30% of the luminal diameter.

SPSS version 26 was used for data analysis. Intention to treat was used to examine outcomes. The mean value and SD was used to describe the results of continuous data, and differences between groups were analyzed using two-tailed t tests. Categorical data are presented as rates, with chi-square tests used to compare them. Kaplan-Meier curves were used to generate one-year clinical event rates, with log-rank tests used to examine differences between treatment groups. A p value of 0.05 was deemed significant.

RESULTS

Of the total patients, there were 80 (60.6%) male and 52 (39.4%) were females. Both groups were assigned 66 patients and had similar baseline characteristics and angiography data. Based on treatment analysis, the major adverse cardiac events (MACEs) and angiographic success rate were similar: 5.2% and 96.8% in coronary stenting versus 5.9% and 92.4% in balloon angioplasty group respectively. About 4.2% patients underwent abrupt closure changes within 30 days. Stenting conveyed the substantially larger lumen (1.52 mm vs. 1.32 mm, $p < 0.001$) at 6 months and larger post-procedural lumen diameter (2.31 vs. 1.82 mm, $p < 0.001$) as compared to balloon angioplasty. The incidence of restenosis was found 36% and 56% in coronary stenting and balloon angioplasty respectively. The survival rate (event-free) was achieved in 79% and 69% ($p = 0.021$) in coronary stenting and angioplasty respectively. Clinical characteristics and demographic details are shown in Table-I. Figure-1 illustrates the gender's distribution. Various risk factors for small coronary arteries stenting compared for both groups are illustrated in Figure 2. Patient angiographic characteristics are shown in Table-II. The incidence of restenosis in both groups are shown in Figure-3.

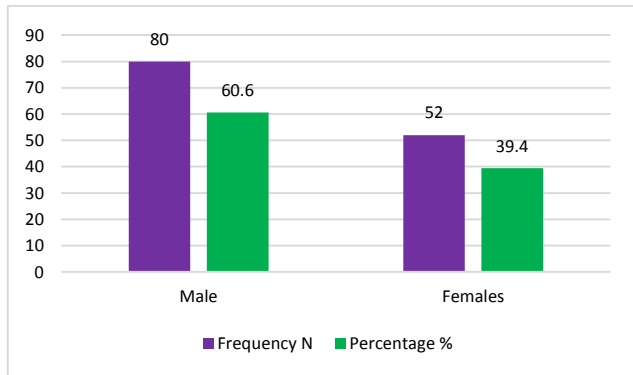


Figure-1: Gender's distribution

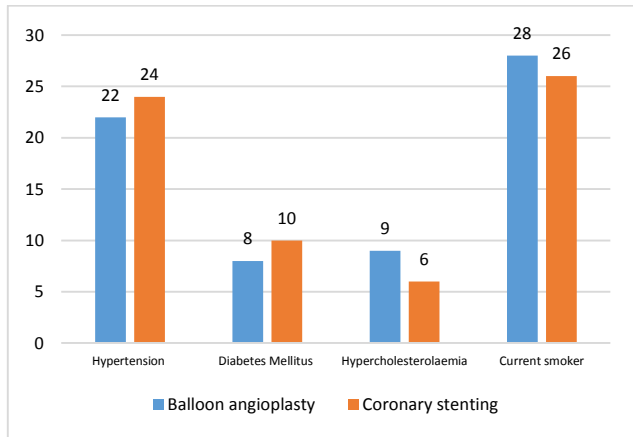


Figure-2: various risk factors compared to both groups

Table-1: Clinical characteristics and demographic details

Parameters	Balloon angioplasty (N=66)	Coronary stenting (N=66)
Age (yrs.)	58.42±6.4	57.53±5.6
Gender (M/F)	42/22	38/30
Unstable angina	13 (19.7%)	12 (18.2%)
Previous myocardial infarction	8 (12.1%)	10 (15.2%)
Disease vessel		
1	35 (53%)	33 (50)
2	18 (27.3%)	17 (25.8)
3	13 (19.7%)	16 (24.2)

Table-2: Patient angiographic characteristics

Parameters	Balloon angioplasty (N=66)	Coronary stenting (N=66)
Dilated artery		
LAD	36 (54.5%)	29 (43.9%)
RCA	20 (30.3%)	20 (30.3%)
LCX	10 (15.2%)	17 (25.8%)
Lesion types		
A	26 (39.4%)	22 (33.3%)
B	40 (60.6%)	44 (66.7%)
Proximal diameter (mm)	2.51±0.23	2.56±0.22
Balloon to artery ratio	1.12±0.10	1.21±0.72
Maximal inflation pressure (balloon), atm	11.8±2.2 (10–16)	12.6±2.1 (10–16)
Acute gain (mm)	1.51±0.54	1.92±0.65
Angiographic restenosis	18/60 (30%)	22/60 (36.7%)

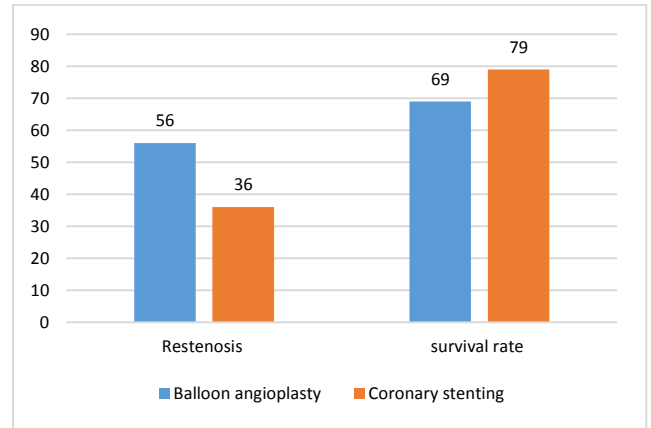


Figure-3: Comparison of incidence of restenosis in both groups

DISCUSSION

The current study mainly compared the efficacy of balloon angioplasty with coronary stenting in small coronary arteries and found that optimum balloon angioplasty with preliminary stenting may offer a viable therapeutic option for lesions affecting small coronary arteries. Among patients undergoing coronary stenting and those undergoing balloon angioplasty, restenosis resulted in 36% and 56%, respectively. In treating small coronary artery lesions, an optimal balloon angioplasty was comparable to a primary stent placement. As a result of these results, balloon angioplasty may be an effective main therapy for these lesions, indicating that optimum balloon angioplasty with partial stent placement is a more effective strategy for treating small vessel diseases than primary stenting. Primary angioplasty strategies such as coronary stenting are becoming increasingly popular in order to improve clinical outcomes. In the field of interventional cardiology, stents have made a significant contribution, but their use remains limited by several limitations, including high prices and in-stent restenosis. In prior studies, it has been shown that coronary stent placement is significantly less likely to result in clinical and angiographic restenosis than balloon angioplasty [15, 16].

By using antagonistic balloon dilation techniques for the gain of greatest lumen, balloon angioplasty has recently improved its efficacy. Angiographic restenosis and clinical outcomes did not differ significantly between Optimal Coronary Balloon Angioplasty versus Stent (OCBAS) [17]. It is plausible that the strategy could be applied to lesions in smaller coronary arteries as well, since our findings are comparable with those from the OCBAS study.

There have been conflicting reports in this setting in the past. As per ACCC, stenting in small arteries provided no significant enhancement in long-term outcomes when compared to balloon angioplasty [18]. F. Levent et al. [19] conducted their study on 2602 patients and reported that restenosis had a small independent predictor in terms of small coronary or capillary size.

Numerous additional studies have found that stenting had little benefit in tiny arteries [20, 21]. In contrast, another study conducted by Savage et al reported that the restenosis rate in stenting and balloon angioplasty was 34% and 55% respectively [22]. Another study reported that restenosis rate was 30% in balloon angioplasty in implantation of small vessels (3mm) stents [23].

Jeger et al. [24] displayed similar outcomes (35.7% versus 30.9%, respectively) with the NIR stent. Divergent outcomes may be explained by several variables in patient selection and procedures. In a previous study, complicated lesion rate was 75%, with complete occlusions (7%) and longer stents (20.8±10.9 mm) and numerous lesions (34.3%) being utilized, both of which were associated with a worse result following stenting [25, 26].

Despite the lesions acute or subacute thrombosis and higher risk, the current study found that coronary stenting is a safe and reliable technique and these findings were comparable with previous study [27]. During the 6-month follow-up period, the risk of major adverse cardiac events was significantly lower in the stent group (13.6% versus 27.1%), which compares well with all prior data from non-randomized or randomized trials [28, 29]. The adverse event rate in the balloon angioplasty arm is consistent with prior studies in this situation [30].

CONCLUSION

The present study found that optimum balloon angioplasty with preliminary stenting may be a viable therapeutic option for lesions in small coronary arteries. Restenosis was found to be 36% and 56% in coronary stenting and balloon angioplasty, respectively. Stent implantation in small coronary arteries is practical and safe, and it is extremely efficient in minimizing restenosis and the need for repeat revascularization of the target lesion.

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