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Original article

Balloon embedded stenting: A novel technique for percutaneous coronary intervention of bifurcation lesions, experience in Indian population

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1. Introduction

A bifurcation lesion is defined as "a coronary artery narrowing occurring adjacent to, and/or involving, the origin of a significant side branch(SB). A significant SB is a branch, whose loss is of consequence to a particular patient (symptoms, location of ischemia, viability of the supplied myocardium, collateralizing vessel, left ventricular function.)".[1] Bifurcation lesions account for 15–20% of interventions undertaken in a catheterization laboratory. The currently recommended strategy for bifurcation lesion is to use a single stent for main vessel and provisionally stent the side branch if there are suboptimal results in the side branch. However, approximately 35% of patients require crossover to two stent approach with this strategy.[2] Further there are many bifurcation lesions which need an elective two stent strategy specially if the lesion involves left main coronary artery(LMCA). This underscores the need for an optimal, safe and effective two stent strategy for bifurcation lesions. Several two stent techniques like crush, culotte, T-stenting, T-stenting and protrusion (TAP stenting) and simultaneous kissing stenting(SKS) have been described, none of which have been proved to be superior over the other. Culotte and TAP technique are very often used and both of these require the primary stent to be recrossed which can be difficult sometimes. Failing to recross the wire through the struts of the first stent compromises the unstented branch and can be life threatening specially if it involves LMCA or proximal LAD artery. Recently few techniques have been developed which aim to increase the safety of this approach and enhance side branch protection.[3,4] We here in intend to describe a similar strategy in indian population in which a wire with an embedded balloon in the unstented branch safeguards the eventuality of a failed culotte or TAP stenting and facilitates conversion to bail out crush.

2. Material and methods

A prospective, observational, non-blinded study in patients from a single tertiary referral cardiac centre. Patients with an indication for percutaneous coronary intervention(PCI) of a de-novo bifurcation lesion were screened. The study included 28 patients who underwent coronary angiogram in our institution and had bifurcation lesions suitable for culotte or TAP procedures between January 2016 to February 2017. Bifurcation lesions were classified according to Medina class. Culotte or TAP stenting technique was used depending on the operator's discretion. Angiographic success was defined as attainment of a residual diameter stenosis of 20% or less with TIMI 3 flow in both the main and side branches. Procedural success was defined as angiographic success without the occurrence of major complications(death, MI or CABG) before discharge. All patients provided written informed consent and the study was approved by the institutional Ethics Committee.

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Technique:-

A schematic diagram of the steps used in the technique is shown in Fig. 1. The steps include:-

1. Wiring of both the main branch and side branch (Fig. 2).
2. Predilatation of both the branches
3. Stenting of the angulated branch while the jailed wire with an embedded balloon was retained in the other branch. (Fig. 3)
4. Rewiring the unstented branch through the primary stent followed by strut dilatation (Fig. 4).
5. Following this, the jailed wire with embedded balloon was removed and Culotte or TAP stenting completed as the case was.
6. However, if the second branch could not be recrossed and flow was impaired, embedded balloon was used to crush the first stent and converted the technique into a bail out crush.
7. Final Kissing balloon dilatation was done in all the cases.

A balloon with the lowest profile (1 × 5 mm) was used in the first 8 cases, keeping in mind the possibility of the balloon getting stuck in the jailed wire. However with gaining experience and achieving success in the first 8 cases, 1.5 × 10 mm balloon was used in the next 5 cases. In the last 15 cases, a 2 × 10 mm balloon was used.

The embedded balloon was kept proximally at the stent in the first 7 cases so that it could help in the rapid conversion to bail out crush. In later cases, the embedded balloon was parked distally. Everolimus eluting stent (promus element, Boston Scientific) was used in all the cases as the first stent to be recrossed.

3. Results

Baseline clinical characteristics of the patients included in the study are shown in Table 1. 20 of the total 28 patients were males. Mean age of patients was 58.2 years. Risk factors included Diabetes Mellitus(n = 15), hypertension(n = 20), smokers(n = 16), dyslipidemia (n = 23) and positive family history of coronary artery disease (CAD)(n = 11). History of an acute coronary syndrome(ACS) was present in 19 patients while the remaining 9 had a history of

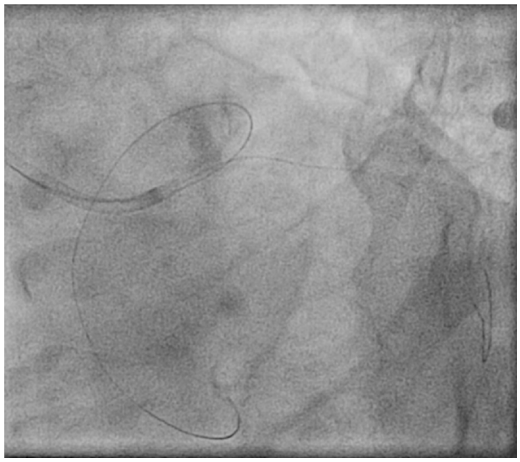

Fig. 2. Both the main and side branch are wired.

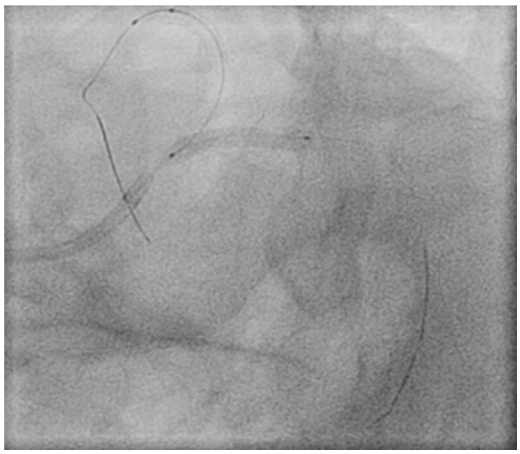

Fig. 3. The angulated branch is stented while a jailed wire with an embedded balloon is retained in the other branch.

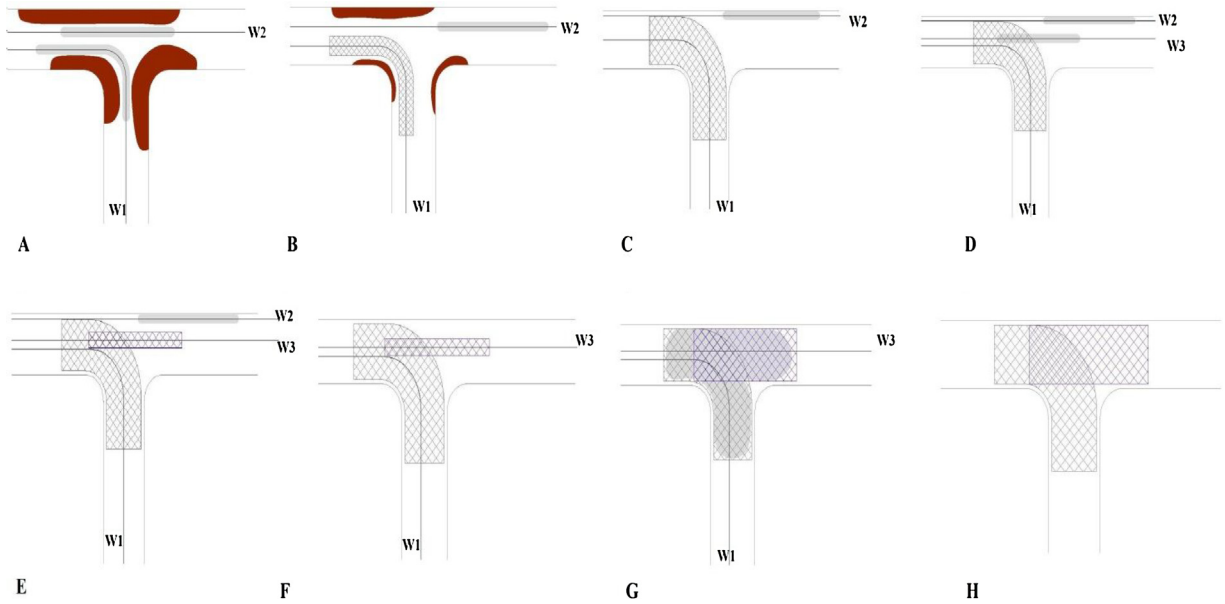

Fig. 1. Schematic diagram showing steps used in the technique. A- predilatation of both the branches. B,C- stenting of the angulated branch with the jailed wire and embedded balloon in the second branch. D- rewiring the second branch through the primary stent followed by strut dilatation. E- the second stent passed via the dilated struts. F- Jailed wire with embedded ballon was removed. G- second stent deployed and final kissing balloon dilatation done. H- final result.

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