“Cannula-in-cannula” technique for turbulence control and suture management in arthroscopic superior capsular reconstruction—A technical note

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ABSTRACT

Arthroscopic superior capsular reconstruction is gaining popularity in managing irreparable rotator cuff tears in younger patients without arthrosis. One of many reasons for the increase in this trend is the simplification of technique using allograft and knotless technology for fixation. Despite all this, turbulence control and suture management are still arduous undertakings. In order to improve visualization and prevent entanglement of sutures, we employed the cannula-in-cannula technique which allowed a continuous fluid management and tangle-free handling of sutures.

Technique

- Under general anaesthesia and/or interscalene block.
- Beach chair position with affected limb held by a pneumatic arm holder.
- Placement of standard arthroscopic portals for diagnostic arthroscopy of glenohumeral joint, then for subacromial scopy and instrumentation.
- Glenoid preparation—Superior surface of glenoid medial to the labrum was prepared with shaver and two double-loaded Hea-llicoi suture anchors were placed at 1 o’clock and 10 o’clock positions.
- Greater tuberosity (GT) preparation—The footprint over the GT was prepared using the combination of aggressive shaver and burr, two Y-Knot® RC with Tape All-suture anchors were placed at the edges of the footprint anteriorly and posteriorly.
- Graft preparation—The measurements were done using a calibrated probe, between the glenoid anchors, GT anchors and glenoid to GT anchors. Acellular human dermal allograft was prepared by adding 5 mm to the anterior, posterior, medial side and 10 mm to the lateral side measurements. The holes were created for passing sutures for side-to-side repair.
- Graft passage—One set of suture strands from each double-loaded glenoid anchors and tapes from GT anchors were retrieved through lateral portal. The incision was extended to widen the lateral portal. A 12 × 40 mm GateWay silicone flexible cannula was inserted into the lateral portal with sutures and tapes outside to it.
  o Sequentially, one set of sutures from the anterior and posterior glenoid anchors and tapes from anterior and posterior GT anchors were retrieved abutting the respective quadrants of the flexible cannula.
  o Sutures and tapes were passed through the graft as per the earlier measurements, using an eyed Mayo needle.
  o Graft shuttled into the subacromial space using “double-pulley” technique.
  o Graft fixation—The sutures from glenoid anchors were tied to complete double mattress sutures over the glenoid.
  o A 7 .0 mm FOREST GREEN plastic cannula was inserted into the flexible cannula leaving the tapes outside to it.
  o The trocar of the plastic cannula was used to spread the graft and keep the cannula above the graft, and the inflow fluid line was connected to the port in the plastic cannula to inflate the subacromial space.
  o The other set of sutures from the double-loaded glenoid anchors were used for the side-to-side repair by passing one strand through the graft and other through the infraspinatus and rotator interval tissue, posteriorly and anteriorly, respectively, at the level of the glenoid.

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Without cuff tear arthropathy, arthroscopic SCR is advantageous as it is total shoulder arthroplasty [8]. But particularly in younger patients, simple debridement, partial repair with or without tuberoplasty to complex with severe cuff tear arthropathy, non-functional deltoid, and irreparable tions and no glenohumeral arthritis [6,7]. Contraindications are patients superior rotator cuff tear, with loss of forward movement [3,6].

The preliminary results of SCR using dermal allografts are encouraging [3], making it indispensable to learn to perform this surgery. The suture management is the key to this surgery. Suture entanglement and twisting of the graft are the potential ruiners to a flawless surgery. There were multiple advantages of the cannula-in-cannula technique in handling sutures and improving the visibility during surgery. This technique enhanced the visualization of the arthroscopic field through better fluid management. The lateral working portal was kept free from sutures at every step of surgery and only the sutures for the pertaining steps were passed through the cannula, thus creating multilevel check on sutures from getting tangled and not crowding the portal while instrumentation, without the need of multiple percutaneous portals to park the sutures. With the use of a plastic cannula, there was an ease in spreading the graft and maintenance of the cannula above the graft while performing further instrumentation. The port in the plastic cannula connected to fluid inflow line kept the subacromial space inflated without the need of higher pump pressure and with better turbulence control. This step also maintained the working space between the cannula and GT laterally and avoided the need for holding the cannula pulled laterally to increase the working space, seen when the flexible cannulas were used alone. A retrospective review of patients operated with arthroscopic SCR using cannula-in-cannula technique by the senior author (Y.G.R.) between February 2019 and December 2021 with a minimum post-operative follow-up of 12 months was performed. A total of 42 patients with mean age of 57.2 (range, 48–69) years, including 36 male and 6 female patients and an average follow-up of 14.5 months, were analysed. Among 42 patients, there were 26 patients with primary and 16 with secondary SCR for prior failed rotator cuff repair. The visual analogue scale score improved pre- to post-operatively from 3.9 to 1.6 and the University of California of Los Angeles shoulder score from 13.4 to 29.8 points. Range of motion (in degrees) of forward flexion, scapular plane abduction improved from 120.7 and 86.6 preoperatively to 159.8 and 105.5 at final follow-up, respectively. There were 3 (7.1%) patients with retear but none required any revision surgery or reverse total shoulder arthroplasty at the time of their final follow-up. A similar technique has been in use to manage sutures in arthroscopic rotator cuff repair with patch augmentation (40 cases since 2019), reporting of which is under way.

Disadvantages

There were no complications specifically related to the cannula-in-cannula technique. However, there were some disadvantages of this technique. There was an added cost of the second cannula, but the time saved by the ease in suture management outweighed this added cost to the surgery. Occasionally, there were situations with difficulty in retrieving sutures while they were parked outside the plastic cannula (i.e. between the flexible and plastic cannula) due to friction. This was dealt by first retrieving through anterosuperolateral portal and then through the lateral portal. There were few added steps to retrieve sutures and tapes through plastic cannula before knot-tying and lateral fixation, respectively, when cannula-in-cannula technique was used as compared to a single cannula, which added few extra minutes to the surgery. We believe that in surgeries like arthroscopic SCR, few extra minutes spent to simplify the complexity will always be worthwhile.

Conclusion and future perspective

Arthroscopic SCR using cannula-in-cannula technique is a simple modification with great advantages, such as improved visualization, better turbulence control and easier suture management, without any complications specifically related to it. Future clinical studies are required to establish the outcomes of arthroscopic SCR using dermal allograft and factors promoting healing of the graft.

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Disclaimer

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Institutional review board approval

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Conflict of interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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