



Figure 2: Outcomes in DDH case treated by single stage surgery. (a) Functional results at latest follow-up, (b) Preoperative radiograph, (c) Radiograph at latest follow-up

Two patients were operated with repeat open reduction and transfixation with k wires and 1 patient was operated with repeat open reduction and VDRO. At the latest follow-up, these patients had a satisfactory clinical outcome.

DISCUSSION

The aim of the treatment after walking age group [age more than 1 year] in DDH is to get a good clinical and radiological outcome with minimal persistent dysplasia and prevent secondary degenerative arthritis. Hence, we have analyzed clinical and radiological outcome of one-stage surgical treatment in a mid-term follow-up. In our study, mean age at the time of surgery 34.68 months (2.86 years), which is consistent with previous other reports.^[6,7,12] However, the higher preponderance of females (75.53%) in the study group could be attributed increased ligamentous laxity in females as a result of the circulating maternal hormone relaxin.^[3,13] Left side DDH was seen in 59% of cases. This is perhaps due to the left occiput anterior positioning of most nonbreach newborns where the hip is adducted against the mother's spine with limited space for abduction.^[3] We noticed bilateral hip involvement in 7 patients (20.59%) out of the 34 patients, although 26%–36% bilateral hip involvement is previously reported.^[12,14,15] The clinical outcome observed in this study is also comparable to Berkeley *et al.*,^[16] Zadeh *et al.*^[6] who had done open reduction as primary surgery, Haider *et al.*^[17] who had done open reduction, acetabuloplasty as primary surgery and El Sayed *et al.*^[5] who had done open reduction, femur and pelvic osteotomy as the primary surgery which suggests that despite minor differences in the surgical approaches to correct DDH, a similar clinical improvement is observed.

The improvement in radiological outcome observed in this study by Severin's grading was similar to that reported by

other studies.^[5,6,12,18] The age, gender, side, Tonnis grade of classification, and unilateral or bilateral involvement are considered as factors that can influence the surgical outcome. Various studies have considered these factors as the variables that can affect the outcome.^[5,19] The mean age at surgery for hips which had an excellent functional outcome was 2.71 years, whereas mean age for fair outcome was 4 years. The Severin's grading was not affected by the age, gender, or the time of surgery.^[5,7,20] Although the hips with unilateral involvement had an excellent McKay's outcome compared to 50% of the hips with bilateral involvement. This shows that the unilateral hips have a better outcome in comparison with bilateral hip involvement, probably due to favorable mobility and biomechanics.

In contrast to a previous report,^[14] the higher Tonnis grade of dislocation had a more unsatisfactory functional outcome, but this relation was statistically not significant. Higher Tonnis grade of dislocation will require either pelvic or femoral procedures along with open reduction, which has higher chances of stiffness of hip and lead to poor McKay's functional outcome. There was no statistically significant relation between Tonnis grade of dislocation and Severin's radiological outcome.^[14] The good functional outcomes observed in this study are similar to that reported by Tezeren *et al.*,^[21] suggesting appropriate surgery based on age and intra operative assessment will give satisfactory functional outcome irrespective of whether acetabular/femoral procedures are performed. The re-surgeries were due to the hips with subluxation during their follow-up and hence were operated. Nevertheless, the re-surgeries rate in our study was very low as all of them had single staged combined surgical intervention. This study was however at a mid-term follow-up stage; hence, it may be too early to draw firm conclusions as the long-term follow-up of these patients are ongoing.

CONCLUSION

Single-stage surgery in which acetabular/pelvic osteotomies are combined with primary procedure based on intraoperative assessment of stability is a safe and effective procedure after walking age group as it provides satisfactory functional and radiological outcome and decreases the chances of re-surgeries.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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