**Introduction**

Varicose vein is a common problem in the west.\(^1\) In India, the incidence in the general population is not known. A survey among railway sweepers in India has shown that the overall prevalence among South Indian sweepers is 25.8% and among the North Indian sweepers is 6.8%.\(^2\) However, it causes significant morbidity if recurrence is common if the site of incompetence is not properly localized or missed before surgical treatment. A number of tests both noninvasive and invasive have been described, but simple clinical tests and Doppler ultrasound have been found to be more practical and accurate in the diagnosis of incompetent venous systems. This study aims to compare the results of clinical tests and Doppler ultrasound with the Turner-Warwicks bleed back sign in the diagnosis of incompetent varicose veins.

**Materials and Methods**

In this study, fifty patients with varicose veins admitted to the Department of General Surgery, Mahatma Gandhi Medical College and Research Institute, Puducherry, from September 2011 to August 2013 were studied. Patients with dilated tortuous veins in the lower extremity and operated were included in the study, and patients who had deep vein thrombosis, superficial thrombophlebitis, and recurrent disease were excluded from the study.

The patients were evaluated clinically using Brodie-Trendelenburg tests I and II, multiple tourniquet tests, Schwartz test, Perthes test, Morrissey’s cough impulse test, and Fegan’s test. Doppler ultrasound evaluation was done using GE Voluson 750 Pro Ultrasound scanner, with a linear probe of 7–12 MHz frequency. Reflux was demonstrated by change of color from red to blue. Preoperatively, the competence of the saphenofemoral junction and the sites of incompetent perforators were marked independently by a clinician and a sonologist. Incompetent saphenofemoral incompetence (SFJ) was treated by flush ligation.

**Results**

Saphenofemoral incompetence was correctly diagnosed in all 53 limbs both by clinical test and Doppler ultrasound. In the evaluation of perforator competency, the sensitivity was 82.93% by clinical tests and 97.56% by Doppler ultrasound. **Conclusion:** Doppler ultrasound evaluation of the varicose veins should be done for accurate diagnosis in all patients before planning surgery.

**Keywords:** Clinical tests, Doppler ultrasound, varicose veins, Turner-Warwicks bleed back sign
incompetent perforators by subfacial ligation by small transverse incisions. Intraoperatively, incompetency was confirmed by Turner-Warwicks bleed back sign.[9]

The sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) of clinical tests and Doppler ultrasound were assessed and compared using SPSS software trial version (IBM Corp, Armonk, NY).

**RESULTS**

Fifty patients were included in this study, and out of fifty patients, three patients had involvement of both lower limbs; hence, 53 limbs were studied. Out of fifty patients, 43 (86%) were male and 7 (14%) were female. The youngest was 18 years and the oldest was 68 years of age. Out of the 53 limbs studied, 23 (43.4%) were right and 30 (56.6%) were left. Out of 53 limbs, in 45 limbs, SFJ was incompetent by both clinical and Doppler evaluation and confirmed at surgery. Hence, the sensitivity, specificity, PPV, and NPV were 100% both by clinical tests and Doppler ultrasound [Table 1].

In these 53 limbs, clinical tests detected a total of 75 sites of perforator incompetency, of which 66 (86%) were below knee and 9 (12%) were above knee. Doppler evaluation revealed a total of 87 sites; 77 (88.5%) were below knee and 10 (11.5%) were above knee. Intraoperatively, 82 sites were confirmed, among which 72 (87.8%) were below knee and 10 (12.2%) were above knee [Table 2].

The accuracy of clinical tests in detecting perforators was sensitivity 83.3%, specificity 22.2%, PPV 90.67%, and NPV 12.5%, and the accuracy of Doppler ultrasound was sensitivity 97.56%, specificity 12.5%, PPV 91.9%, and NPV 33% [Table 3].

**DISCUSSION**

Varicose vein is a very common problem and causes a great deal of morbidity.[1] Accurate localization of incompetency is of paramount importance to avoid recurrence after surgery and to reduce morbidity. Although many clinical tests have been described and used, recent studies suggest that clinical methods are unreliable and Doppler ultrasound has great accuracy in identifying sites of reflux.[4]

Accuracy of clinical methods in detecting SFJ incompetence was compared with intraoperative findings and the sensitivity and specificity were 100%. Similarly, Doppler ultrasound was 100% positive. Chan et al. have observed that SFJ incompetence was correctly predicted by clinical methods in 82% of limbs and by Doppler ultrasound in 97%.[5] In another study by Vashist et al., it has shown that in 64 limbs of fifty patients, the accuracy of clinical tests and Doppler ultrasound was 100%.[6] Kim et al. observed that in 70 limbs of 44 patients, the Trendelenburg test had high sensitivity (0.91) but low specificity (0.15), and the handheld Doppler assessment at SFJ had high sensitivity (0.97) and specificity (0.73) of detecting reflux.[7] Incompetent perforators are easy to overlook and difficult to diagnose certainly by any clinical test.[8] The lesser operations commonly practiced for perforators fail to detect (treat) incompetent perforators leading to recurrent varicosities and ulcers. The gold standard imaging (investigation) for detection of perforators is a contrast venography, which has several complications in addition to being invasive. On the other hand, Doppler ultrasound is noninvasive, repeatable and involves no radiation. Vashist et al. have shown that Doppler ultrasound is superior to clinical tests in detecting incompetent perforators. They found that out of 104 incompetent perforators confirmed at surgery, only 64 could be diagnosed by clinical tests (61.5% sensitivity) whereas Doppler ultrasound detected 92 correctly (sensitivity 88.4%).

In our study, the sensitivity was 82.93% by clinical evaluation and 97.56% by Doppler ultrasound in the detection of perforator incompetence. Irodi et al. have concluded that Doppler detection of incompetent perforators is the best noninvasive technique available to detect the number and distribution of the incompetent perforators.[9]

**CONCLUSION**

The results of our study and the findings of a review of studies demonstrate that the clinical tests and Doppler ultrasound are equally effective in demonstrating SFJ reflux, but the clinical tests are inaccurate in assessing the perforator incompetence. Therefore, it would not be possible to plan surgery on the
findings of clinical tests alone. It is suggested that preoperative Doppler ultrasound evaluation should be done in all patients before surgery in addition to clinical tests to avoid recurrence.

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Conflicts of interest
There are no conflicts of interest.

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