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Research Article

Amit Jain's Triple Assessment for Foot in Diabetes- the Simplest and the Fastest New Screening Tool in the World

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Abstract:
Diabetic foot complications have a direct cost on family and indirect cost on the community. There are various studies that shows majority of diabetes people not receiving adequate foot care. Diabetic foot screening thus become an important component in identifying the high risk patients. There are very few screening tools available for diabetic foot worldwide. The author proposes the new 'Amit Jain's triple assessment for foot in diabetes which is the fastest and the simplest diabetic foot screening method in the world and this screening methods addresses the triad of diabetic foot effectively.

Key words: Diabetes, Foot, Screening, Neuropathy, Amit Jain

INTRODUCTION

The prevalence of diabetes mellitus has risen to epidemic proportion all over the world including India [1]. It is quite obvious that even the burden of diabetic foot problem is expected to increase given the increasing global prevalence of type 2 diabetes mellitus [2]. Around 15% of patients with diabetes are likely to develop a foot ulcer in their lifetime [3]. Around 85% of the amputations are considered to be preceded by diabetic foot ulcers [4]. However, recent studies from India using the new Amit Jain's classification for diabetic foot complication that encompassed most of the foot complications seen universally, shows that type 1 diabetic foot complications are more commonly seen in hospitalized patient and are more common cause of amputation [5]. This is already changing our perception on diabetic foot and this classification makes us look beyond the ulcers.

Diabetic foot ulcers for years have known to cause medical and financial burden and it costs as high as $45000 per patient in western countries like USA [6]. Hence, routine screening of patients with diabetes who are at risk of diabetic foot is a necessary step for preventive care and also for optimization of health care resource utilization [7]. There are several studies that showed majority of people with diabetes do not receive foot care including regular foot examination [2]. A study from India showed that only 12.5% of patients had received foot care advice from health care professionals [1].

CURRENT SCREENING MODALITIES IN DIABETIC FOOT

Diabetic foot screening is known to be a cornerstone and starting point of all good diabetic foot care [3]. The author believes that evaluation of diabetic foot can be through screening and through examination and there is a difference in both these evaluation. Screening of the foot is a quick evaluation identifying those factors that leads to risk of amputation. An examination of foot refers to a detailed evaluation that can be laborious and time consuming method.

There are many screening tools, examination and campaign that have been proposed in diabetic foot specialty like the 3-minute foot exam, CPR for diabetic foot, Inlow's 60 second diabetic foot screening tool, simplified 60 second foot screen, etc [8, 9, 10, 11]. Each has its own benefit and limitations and the author wouldn't discuss them in this article. The above screening tools like the 60 second screenings are for diabetic foot in complete. There are various focal screening methods used which are either for neuropathy or for ischemia [12, 13, 14]. The CPR for diabetic foot is a campaign [9] and the 3-minute foot exam [8] is a detail evaluation of foot and they don't come under screening tool.

CLINICAL EXAMINATION IN SURGERY

Clinical examination is considered an art in our medical teaching and it forms an important and a basic essential part in surgical learning [15]. With practice most of it will become a habit in professional career [16]. An essential part of clinical examination is local examination [16], which is an examination of the affected part. Classically, a common sequence is followed [17] like inspection where you see/look, palpation where you feel, percussion and auscultation where you hear [15, 16]. This is a general scheme when you examine most of the cases like in abdominal case, lump examination

case, etc. Specific tests are done in specific condition like movement with deglutition in thyroid swelling case, deep ring test in hernia case, etc [15, 16]. In orthopedics also, we do inspection, palpation, examination of movements, conduct special tests, etc [17]. The inspection [see/look], palpation [feel], movement [move joints actively or passively] etc applies in general to all bone examination like hip, knee, foot, wrist, elbow, etc [17, 18]. The musculoskeletal examination works on a simple system originally designed by Apley [18]. It consists of four letter words divided into threes. It describes in general the look, the feel and move for skin, soft tissue and bone with the move component divided further into Active, Passive and stability [18]. This concept is in general for a musculoskeletal examination [18].

TRIPLE ASSESSMENT OF BREAST LUMP IN SURGERY

In patients with breast lump, a diagnosis is made by combination of clinical assessment, radiological imaging and tissue sampling [either cytological or histological analysis] and this is called the Triple assessment [15, 18]. The triple assessment is considered to be a very useful diagnostic tool that detects patients with breast cancers with an accuracy of 99.3% in a study by Jan et al [19].

The author employed the above 2 combination of triple assessment concept from breast where it is used for diagnosis of breast cancer and the routine clinical examination in surgery and applied it on the foot to form the '***AMIT JAIN'S TRIPLE ASSESSMENT OF FOOT IN DIABETICS***" which can be used as a screening evaluation tool.

AMIT JAIN'S TRIPLE ASSESSMENT OF THE FOOT IN DIABETES

Diabetic foot is characterized by classical triad of neuropathy, ischemia and infection [4, 20]. Screening of these 3 entities is hence essential for prevention of amputation in people with diabetes.

The author classifies diabetic foot infections in general to be primary where the infection occurs directly into the foot and secondary where the infection occurs in preexisting pathology like an ulcer. Amit jain's type 1 diabetic foot complications [5] like abscess, cellulitis, necrotizing fasciitis, etc are all primary diabetic foot infection. Ulceration allows an avenue for infection and around 56% of diabetic foot ulceration becomes infected with 20% of them ending up in some form of amputation [6].

The author proposes a new screening method known as Amit Jain's triple assessment for foot in diabetes that shall address the triad of diabetic foot [4, 20] namely neuropathy, infection and ischemia. The triple assessment of foot is a basic screening type of evaluation of the foot through 3 methods namely a LOOK, FEEL and TEST [LFT].

LOOK

This component of triple assessment aims at identifying infection/ulcer or even the pre ulcerative stage, the callus. The parts of the foot that needs to be seen are the dorsum [Figure 1], the plantar surface [Figure 2] and the interdigital spaces [Figure 3].

Figure 1 showing the dorsum of the foot.

Figure 2 showing the plantar surface of foot.

Figure 3 showing the inspection of interdigital space in the foot.

When these sites are inspected one needs to ensure a good light especially in dark skin people where one can miss subtle findings.

FEEL

This component of triple assessment aims at detecting ischemia. There are3 arteries that supply the foot namely the dorsalis pedis artery, posterior tibial and the peroneal artery. In clinical practice, we check for dorsalis pedis and posterior tibial artery [Figure 4].

Figure 4 showing the palpation of posterior tibial artery to assess the blood supply to foot.

One can check both these arteries to assess the adequacy of blood flow to the feet. In around 10 % of people, the dorsalis pedis may be absent or too small to feel [21] and in such scenario, one could try assessing the anterior tibial artery.

TEST

This component of triple assessment aims at detecting neuropathy. There are various methods for assessing neuropathy and they range from simple bedside methods to advance instrumentation [22, 23, 24]. The simple bedside methods that can be used in clinical practice are Semmes - Weinstein monofilament [Figure 5], tuning fork [Figure 6], ankle reflex, pin prick tests, etc [22, 25]. Biothesiometer [Figure 7] and vibratip are other devices used for detecting neuropathy [24, 25].

Figure 5 showing the Semmes Weinstein monofilament testing the touch sensation in the foot.

Figure 6 showing the 128 Hz tuning fork used to test the vibration sensation in the foot.

Figure 7 showing the biothesiometer measuring the vibration perception threshold.

Tuning fork, vibratip and Biothesiometer are used to assess vibration sensation whereas pin prick and semmes Weinstein monofilament is used to test touch sensation.

Semmes Weinstein monofilament is frequently used modality in the west for neuropathy detection and inability to perceive 10 G of force 5.07 monofilament is associated with large fiber neuropathy [23].

The 128Hz tuning fork provides an easy and inexpensive test of vibration sensation [22]. Specialty centers can use biothesiometer for neuropathy whereas other centers can employ one or at least 2 of the methods in combination from any of the following- monofilament test, pin prick, tuning fork, etc.

Many of the clinics and primary health centers in developing countries like India can utilize the pin prick for touch sensation in case monofilament is not available [or any other easy methods to detect touch sensation] and the tuning fork for vibration sensation. Combination yields better results.

One should check at least 3 to 4 sites while assessing neuropathy like the pulp of great toe, the first MTP region, the

5th metatarsal head or the heel.

IMPORTANCE AND ADVANTAGES OF THE NEW AMIT JAIN'S SCREENING METHOD

The new Amit Jain's triple assessment for foot in diabetes shall henceforth form the minimum criteria for basic screening of the foot in diabetes in any part of the world including India. The 3 components of triple assessment shall be aimed at identifying all the 3 triad of diabetic foot.

This new LFT screening for diabetic foot is very simple, easy to remember, practical, can be used as a teaching tool globally for undergraduates and postgraduates in medicine and nursing field. Further it can be applied with ease by different specialist and health care professionals in the different part of the world without requiring advance training. This screening tool shall also serve to be a minimum mandatory record of diabetic foot evaluation and shall avoid any future medico legal issues that can arise for not assessing the foot in diabetic patients thereby leading to amputation due to missing of foot examination by the treating physician.

This is in fact the fastest screening tool till date in the world. The subsequent action after screening depends upon the health care professional and his knowledge in dealing with diabetic foot and it can range from advice for foot care to preventive measures and instituting the treatment.

AMIT JAIN'S SINGLE ASSESSMENT AND DOUBLE ASSESSMENT FOR FOOT

Once a triple assessment is done by the clinician in diabetic patient, in the subsequent follow up visits over the year, the health care professional can just do a single assessment and that is the LOOK component. Even the patient or his relative can do the single assessment at their home at frequent interval. Even the paramedics and health care workers if trained in under developed or developing countries like India; the single assessment can be done by them in community in identifying high risk feet in diabetes.

Double assessment is sometimes done in patients where triple assessment may not be possible like in ICU where you can assess the LOOK and FEEL component but not the TEST component to assess the neuropathy if the patient is on ventilator or very fragile. If a health care worker is trained, then he can perform a double assessment in community through the LOOK component where they can see the feet and the TEST component where they can assess the neuropathy with simple methods like tuning fork, monofilament test, Ipswich touch test [25] or pin prick based on the availability of these simple tools.

AMIT JAIN'S ADVANCED LFT FOR DIABETIC FOOT

The triple assessment of the foot that employs Look, Feel and Test component [Basic LFT] aims at detecting the triad of diabetic foot namely neuropathy, infection and ischemia and it serves as a useful screening tool. The same LFT component can be used for a detailed examination of the diabetic foot in a surgical setup or a specialty diabetic foot setup. For example, the Look component that aims to identify infection or ulcer in screening can also assess for any bony deformity like hammer toe, claw toes, charcot foot, etc or assess features of ischemia like loss of hair, brittle nails, etc or footwear assessment in the advanced LFT. Similarly, the FEEL component that assesses the blood flow by palpating the artery in the screening can also be used to assess the rise of local temperature [cellulitis or acute charcot foot]/ decrease in local temperature [ischemia] or any local tenderness [Example – abscess] in the advanced LFT. Similarly, the TEST component that is used to assess neuropathy in screening can also be used for testing ABI or probe to bone test for osteomyelitis in the advanced LFT examination. It is up to the centers/ surgeons to decide which essential clinical features they want to include in the advanced LFT for the diabetic foot.

CONCLUSION

Screening of foot in diabetes is essential for preventing amputation so that it can reduce the burden on the patient and its family and the society. Diabetic foot is often neglected both by the patient and the clinicians. Although various screening methods exist for diabetic foot they are difficult to be remembered and often require chart for recording. The new Amit Jain's triple assessment for foot in diabetes is a new screening tool that addresses the triad of diabetic foot namely neuropathy, infection and ischemia in a simplest and quickest way. This is the fastest screening tool in diabetic foot and henceforth shall serve to be a minimum mandatory requirement for evaluating a foot in diabetics in the world.

REFERENCES

1] Kishore S, Upadhyay AD, Jyotsna VP. Awareness of foot care among patients with diabetes attending a tertiary care hospital. Nat Med J Ind 2015;28(3):122-125.

2] Chiwanga FS, Njelekela MA. Diabetic foot: Prevalence, knowledge and foot self-care practices among diabetics patients in Dar es salaam, Tanzania – a cross-sectional study. J Foot Ankle Resear 2015;8:20.

3] Stang D. A new approach to preventing diabetic foot ulceration. Practice Nursing 2015;26(9):408-409.

4] Pendsey SP. Understanding diabetic foot. Int J Diabetes Dev Ctries 2010;30(2):75-79.

5] Jain AKC. Type 1 diabetic foot complication. J Diab Foot Comp 2016;8(1):17-22.

6] Wu S, Driver VR, Wrobel JS, Armstrong DG. Foot ulcers in the diabetic patient, prevention and treatment. Vascular Health and Risk management 2007;3(1):65-76.

7] Woodbury MG, Sibbald RG, Ostrow B, Persaud R, Lowe JM. Tool for rapid easy identification of high risk diabetic foot: Validation and clinical pilot of the simplified 60 second diabetic foot screening tool. Plos One 2015;10(6):e0125578.

8] Miller JD, Carter E, Shih J et al. The 3-minute diabetic foot exam. J Fam Prac 2014;63(11):646-656.

9] Stang D, Leese G. CPR for diabetic feet. TDFJ

2014;17(1):16-18.

10] Sibbald RG, Ayello EA, Alavi A et al. Screening for high risk diabetic foot: A 60 second tool. Adv Skin Wound Care 2012;25(10):465-70.

11] Kuhnke JL, Botros M, Elliott J et al. The case for diabetic foot screening 2013;1(2):8-14.

12] Vijay V, Snehalatha C, Seena R, Ramachandran A. The Rydel Seiffer tuning fork: An inexpensive device for screening diabetic patients with high risk foot. Pract Diab Int 2001;18(5):155-156.

13] McAra S, Trevethan R, Wang L, Tinley P. Clinical vascular screening of the foot: For Life and limb. Diabetes and Primary Care Australia 2017;2:16-24.

14] Chan AW, Macfarlane IA, Bowsher D, Campbell JA. Weighted needle pin prick sensory thresholds: a simple test of sensory function in diabetic peripheral neuropathy. J Neurology, Neurosurgery, Psychiatry 1992;55:56-59.

15] Bhat SM. SRB's Clinical methods in Surgery, 2nd Edition. Jaypee, India, 2015

16] Das S. A manual of clinical surgery, 6th Edition. India, 2004

17] Mc Rae R. Clinical orthopedic examination, 5th Edition. Elsevier, India, 2005

18] Russell RCG, Williams NS, Bulstrode CJK. Short practice of surgery, 23rd Edition. Arnold, UK, 2000.

19] Jan M, Mattoo JA, Salroo NA, et al. Triple assessment in the diagnosis of breast cancer in Kashmir. Indian J Surg 2010;72:97.

20] Saleem S, Maken ZH, Farooq R et al. The great diabetic debate: what part does the physician play in patient's foot care knowledge? Ann Pak Inst Med Sci 2016;72-76.

21] Vijaylakshmi S, Raghunath G, Shenoy V. Anatomical study of dorsalis pedis artery and its clinical correlations. JCDR 2011;5(2):287-290.

22] Jayaprakash P, Bhansali A, Bhnasali S et al. Validation of bedside methods in evaluation of diabetic peripheral neuropathy. J Med Res 2011;133:645-649.

23] Morshed GM, Mashahit Ma, shaheen HA. Simple screening tests for peripheral neuropathy as a prediction of diabetic foot ulceration. FAOJ 2011;4(11):2.

24] Nizar H, Munro N, Nightingale P, Feher MD. Diagnostic accuracy of the vibratip in detection of diabetic peripheral neuropathy. Br J Diabetes Vas Dis 2014;14:26-29.

25] Giovinco NA, Millers JD. A practical update to comprehensive screening in the high risk diabetic foot. Podiatry management 2015;129-137.