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Original Research Article

Rate of Faulty Horizontal Insulin Injections and Their Impact on Glycemic Control in a Sample of Diabetic Patients Attending Diabetic Clinic in Karbala Province

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Abstract

Traditional correct at (90 degree angle) subcutaneous insulin injection is one of the essential aspects to achieve proper diabetic control strategies. The study aimed to establishpercentage of faulty horizontal insulin injection and its impact on glycemic control in comparison with correctangleinsulin injection.

This prospective study was conducted among patients attending Diabetic clinic in the period between Jan 1st 2009 and Jan 1st 2014. The total number of patients attending diabetic clinic were 750 patients. Of this total, 300 patients using insulin injection were enrolled in the study. The study variables included demographic and treatment data ,gender, age, mode of insulin injection (faulty horizontalinjectionand correctangled insulin injection),glycemic control, attendance to the diabetic clinic frequency, site of injection and local skin complications.

Among the total 110 malepatients, 95 patients(of them used faulty horizontal injection technique, while 15 patients used correct angle injection. The proper glycemic control in the horizontal andcorrectangledinjectiontechnique were 15 patients, and 10 patients respectively. Among female patients, 165 patientsapplied faulty horizontal injectiontechnique and only 25 patientsused correctangledinjection. The proper glycemic control in horizontal and at 90dereeangled injection was 27 patients and 18 patients respectively.

The study discovered highpercentage of faulty horizontal insulin injection technique which was associated with poor glycemic control. The study also disclosed poor attendance ratio among diabetic patients.

Key words: Diabetes Mellitus, subcutaneous Insulin injection.

الخلاصة

يعتبر زرق الانسولين التقليدي (العمودي)من الجوانب المهمة للسيطرة على داء السكري مقارنة مع الزرق الخاطئ المائل للأنسولين وتأثيره على عدم انتظام السيطرة على السكر بالدم وحصول مضاعفات في الجلد. تهدف الدراسة لمعرفة نسبة استعمال الزرق المائل الخاطئ للأنسولين مقارنة مع الزرق العمودي وتأثيره على مستوى السكر في الدم وقياس نسبة حضور مرضى السكري في عيادة السكر.

اجريت الدراسة في عيادة السكري في مستشفى الحسين التعليمي في الفترة بين (٢٠٠٩/١/١-٢٠١٤/١/١)العدد الكلي للمرضى ٧٥٠ مريض شملت الدراسة(٣٠٠مريض) يستعملون الأنسولين شملت الدراسة معطيات العلاج والجنس والعمر وطرق استعمال الأنسولين (العمودي والمائل)،سيطرةالسكر،حضورالمرض، مكان زرق الانسولين ومضاعفات الجلد(مشاهدة نوعية).

اظهرت النتائج بان الاناث كونوا نسبة عالية من المرض (٦٣.٣%)وظهر ان ٩٥مريض من الذكور(٨٦.٤%)يستعملون الزرق المائل الخاطئ بينما ١٥مريض منهم(١٣.٩%)يستعملون الزرق العمودي الصحيح .وظهر ان السيطرة الصحيحة للسكري في الزرق المائل والعمودي كان ١٥مريض (١٥.٧%)و١٠مرضى(٦٦.٦%)متتالية. الاناث ١٦٥مريضة (٨٦.٨%) يستعملون الزرق الخاطئ و٢٥مريضة (١٣.٢%) تستعمل الزرق العمودي الصحيح .سيطرة السكر الصحيح في الزرق المائل والعمودي كان ٢٧مريضة (١٤.٢%) و١٨مريضة (١.٢%)متتالية ...نسبة الحضور لعيادة السكري سنة ٢٠١٣كانت للذكور (٢.٨%) وللإناث(١١.٦%)

اكتشفت الدراسة نسبة عالية من استعمال الزرق المائل الخاطئ ارتبط مع ضعف في سيطرة السكر كما اظهرت الدراسة ضعف في نسبة حضور المرضى الى عيادة السكر في كربلاء خلال تلك الفترة.

Introduction

Diabetes mellitus (DM) is non-communicable chronic metabolic disorder characterized by hyperglycemia with macro- andmicro vascular complications. These complications are either due to absolute insulin deficiency type I (10 %), or impaired insulin secretion and action (insulin resistant) type II (90%) [1,2]. Many patients of type II DM require insulin therapy to get proper glycemic control due to progressive failure of beta cells in the pancreas, which will raise the prevalence of patients usinginsulin [1, 2]. The efficacy of an ideal at 90degree an angled subcutaneous insulin injection achieves appropriate glycemic control and prevents local skin complications[3-8].The recommended target level of capillary plasma glucose are premeal≤110mg/dl and2hr after meal ≤145mg/dl [1-3].Faulty horizontal intracutanous injection will invade both epidermis (keratin nonvascular layer) anddermis (rich blood supply area) leading to destruction of superficial and reticular deep vascular plexus. It also destroys dermal structures (collagen, hair shaft follicles, sweat glands, ducts of apocrine and sebaceous glands, nerves andmuscles [9,10]. The dermal destruction will eventually impair insulin absorption leading to improper glycemic control and local skin complications (scarring, leakage of insulin, bruising, lipodystrophy and infection)[3-8]in comparison with a correct at 90degree anangled S.C technique which will protect the patients from all the aforementioned complications [3].

The target of Diabetic care program is to keep regular patient attendance to theDiabetic clinic.This regular attendance enables the Diabetic patients to be informed about the significance of the correct at 90 degree angle injection technique and trained to do it, in addition to supply their therapeutic needs (medicines and instruments such as syringes) and conducting needed investigations)[11- 13].

Materials and Methods

The study was conducted among patients attending diabetic clinic in Al Hussein teaching hospital in Karbala governorate in the period between 11/1/2009-1/1/2014. The study enrolled insulin requiring diabetes of types, I and II patients of age above 18 yearsold.

Total patients attending Diabetic clinic were 750 patients whom under my care only (Total patients attended Diabetic clinic are 3000).Written consent was taken from each patient. 300 patients registered in Diabetic clinic were receiving insulin therapy were enrolled in this study. The diagnosis were done byfinding both Fasting blood sugar for 2 times of ≥ 126 mg/dl(fasting should be for minimum of 8 hours) and 2 hours post prandial blood sugar of ≥ 199 mg/dl plus HbA1c >6.5 %[1,2]

The patients were regarded as using a correct method of insulin injection if they fulfill the following steps:

1. Make a lifted skin fold and insert needle into the skin at 90° angle
2. Administer insulin
3. Leave the needle in the subcutaneous tissue for 10 sec after the plunger has been fully depressed
4. Withdraw needle from the skin
5. Release skin fold

On the other hand, they are considered as faulty horizontal insulin injection users if they inject insulin by≤30degree without raising skin fold [3].

The study encompassed closed observation for skin complications at the site of insulin injection of angle and horizontal injection(Qualitative observation, not calculated).

Regular attendance of patients during the last year of the study (2013) was labeled if any patient achieves 5 visits or more in this year[11].

Statistical analysis was done according to chia square. Values equal or less than 0.05 was regarded as significant.

Results

300 patients were eligible in this study, 110 males and 190 female whom were on insulin therapy

The study shows that males were 110 patients, 95 patients of them use faulty horizontal technique while 15 patientsuses correct at 90 degree angle injections(Figure 2) and (Table 1).The proper glycemic control among males in horizontal and 90degree angle injections were 15 patient (15.7%) and 10 patients (66.6%) respectively (Figure 3) (Table 1) P value ($p < 0.00$ 1). while uncontrolled glycaemia in horizontal and 90degree anangled injections were 80 patient (48.2%) and 5 patient (33.3%) respectively (Table1)($P<0.00$ 1).

Females who use insulin injection were 190 patients, 165 patients of them use faulty horizontal injection and 25 patient applied correct at 90 degreeangleinjection (Figure 4) and(table2).

The proper glycemic control among females in horizontal and 90degreeangle injection were 27patients (16.3) and 18 patients (72%) respectively (Fig5) ($p <$ 0.00 1).while uncontrolled glycaemia in faulty horizontal injection and correct90degreeangle injection were 138 patient (83.6 %) and 7 patients (28%) respectively ($p < 0.00$ 1). (Table 2).

The regular attendant percentage to diabetes clinic in both genderwere104 patients (13.8%). The males were 21 patients (2.8%), while females were 83 patients (11%) during 1/1/2013 to 1/1/2014. (Figure 6). This indicates that females have much better attendance percentage than males ($p< 0.005$).

Discussion

The study discloses high prevalence of faulty horizontal insulin injection in both genders which explain one of important hidden reasons of inappropriate glycemic control and local skin complications which take place on majority of patients attending Diabetic clinic applied S.C insulin injection in comparison with 90degreeangle injection.

This qualitative observation considered a significant gap in diabetic care program explained by dermal distraction of vascular plexus and its structures by faulty horizontal injection which prevent proper insulin absorption[3-8].

While correct at 90degree an angled insulin injection will avoid dermal distraction andachieve easy insulin absorption and provide proper glycemic control[3]

Previous studies were matching with core of this problem but differ in lower percentage of faulty horizontal insulininjection in comparisonwith this study [3-5].

The high prevalence of faulty horizontal injection in this study can be explained by poor communication with diabetic clinic,this include poordiabetic health education, poor attendances. While other studies show only nurses havepoor knowledge related to insulin injection technique [14].

The females represent the majority of the patients are visiting Diabetic clinic(63.3%)and the attendance rate of diabetic clinic in year 2013 was 13.2%, this result is much lower than many surrounding countries for both gender [11]. The females have higher attending percentage than males ($P<0.05$) explained that females have access time than males. For example: in United Arab Emirate and Saudi Arabia, the attendance rates were 65% and 87% of patients having 5 visits and more than 5 visits each year, respectively ($P<0.005$). This rate indicates high difference although both countries are developing countries [11]. The regular attendance to diabetic clinic helps the diabetic clinic service providers to train the patients on correct at 90degree an angled insulin injection. This low prevalence of attending diabetic clinic could be considered as predictor of poor diabetic care program that lead to improper glycemic control.

The reasons behind this low attendance rates could be related to multifactorial reasons, which include the small number of diabetic centers, poor health education, absent promoting factors (such as providing free glucometers, strips, insulin syringes, insulin andother medicines) because these promoting factors encourage the patients to communicate well with Diabetic clinicservices providers.

As we noticed, the main reasons for attendance to the diabetic clinic were obtainingfree mentioned instrumentswithout awareness or attention to their glycemic control and its complications, this observation need to be proved by further studies in the future.

The studynoticed that the majority of attending patients applied repeated intradermal horizontal S.C insulin injection at the forearm without rotation to other sites despite local cutaneous complications avoiding abdominal area (abdominal phobia) which lead to the aforementionedlocal skin complications [3]. This observation needs further studies to be proved. In conclusion this study disclosed high prevalence of faulty horizontal insulin injection reflecting improper glycemic control, also the study discover very poor attendance ratio.

Conclusion

The study disclosed high prevalence of faulty horizontal insulin injection technique whichwas associated with poor glycemic control. The study also discover poor attendance ratio among Diabetic patients during the study period.

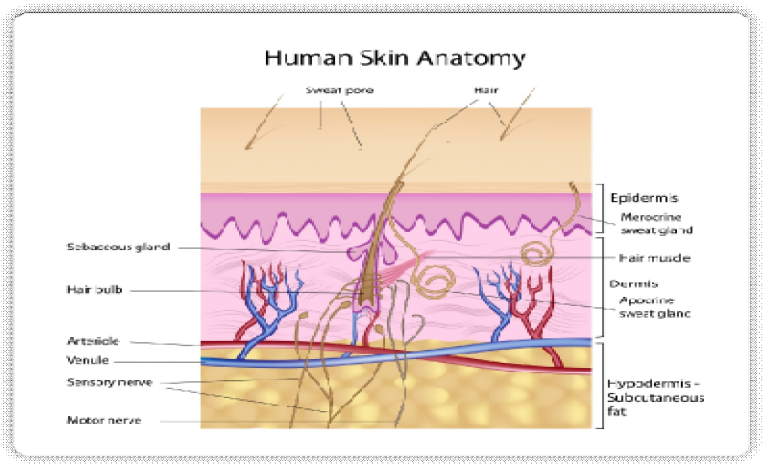

Figure 1: Skin histology

Table 1 : Glycemic control of male patients according to the insulin techniques

Insulin Injection technique	control	Uncontrolled	Total
Incorrect Horizontal technique	15 (15. 8%)	80 (84.2%)	95 (100.0)
Correct Angle technique	10 (66.7%)	5 (33.3%)	15 (100.0)
Total	25 (22.7%)	85 (77.3%)	110 (100.0)

X^2 =19.09, p<0.001

Table 2: Glycemic control of female patients according to insulin injection techniques

Insulin Injection technique	Controlled	Uncontrolled	Total
Incorrect Horizontal technique	27 (16.36 %)	138 (83.63 %)	165 (100.0)
Correct Angle technique	18 (72%)	7 (28%)	25 (100.0)
Total	45 (23.68%)	145(76.31%)	190 (100.0)

X^2 =37.18, p<0.001

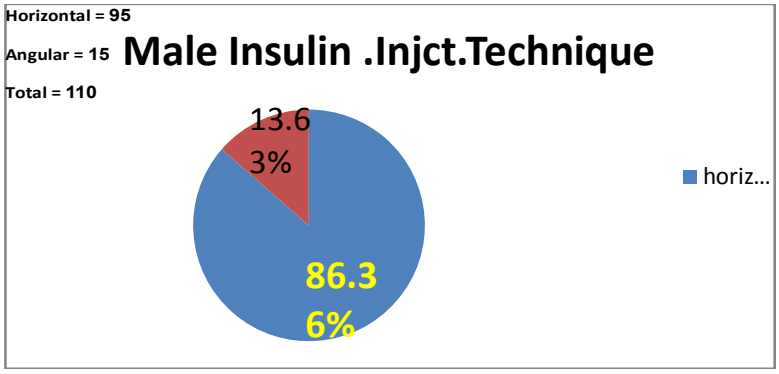

Figure2: Males Insulin injection technique

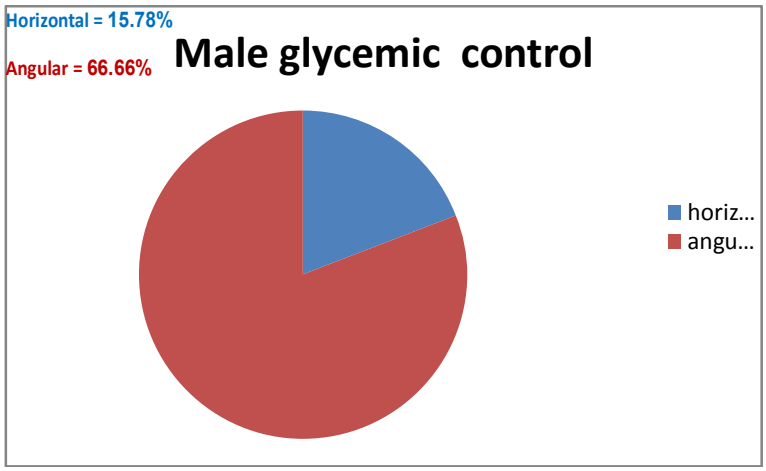

Figure 3 : The Glycemic control distribution according to insulin injection technique among males

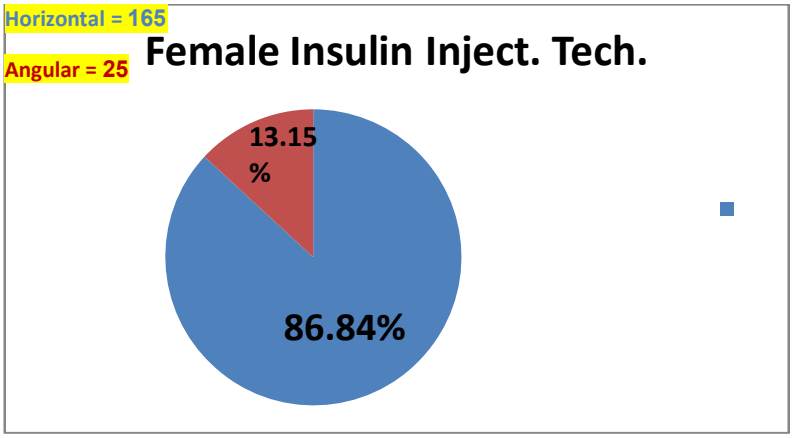

Figure 4 : Female insulin injection technique (total 190)

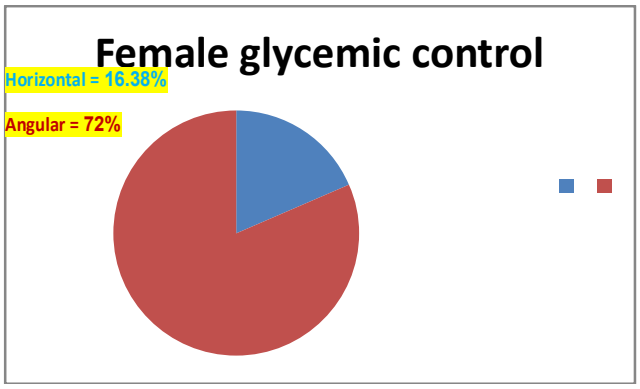

Figure 5: Female glycemic control according to insulin injection technique

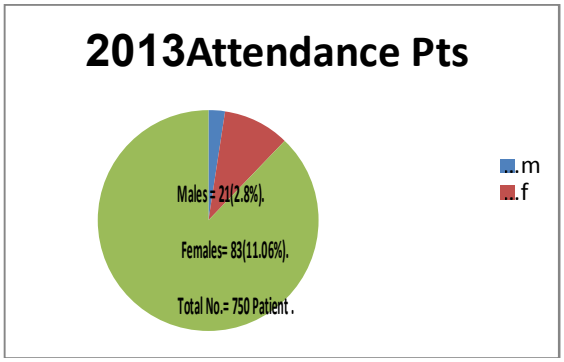

Figure 6 : The regularity of attendance by gender among diabetic patients in 2013

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