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Insulin Pump Therapy

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Introduction- The conception of administer continuous insulin appeared in the United States in early 1960s. Dr Arnold Kadish was the first individual who intended the primary closed-loop insulin pump tool that functioned by administration of continuous insulin to the patient accompanied with automatic blood glucose detecting. Practically this device was unsuitable because of its oversize.[1] The earliest certified pump for marketable use accessible in 1983 was branded as Nordisk Infuser. In 1970s, Pickup and Keen practice transportable insulin pump device for CSII in type 1 diabetes mellitus individuals.[2][3] In the year 1976 the world saw the invention of first insulin pumps.[4] Recently insulin pumps manufactures shows more improvement. It became less in size and more practical for usage. The American Diabetes Association identify that CSII is as unhurt as multiple injection therapy, when suggested measures are monitored.[5]

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INSULINPUMPTHERAPY

Strictly as per the compliance and regulations of:

Insulin Pump Therapy

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I. Introduction

The conception of administer continuous insulin appeared in the United States in early 1960s. Dr Arnold Kadish was the first individual who intended the primary closed-loop insulin pump tool that functioned by administration of continuous insulin to the patient accompanied with automatic blood glucose detecting. Practically this device was unsuitable because of its oversize.[1] The earliest certified pump for marketable use accessible in 1983 was branded as Nordisk Infuser. In 1970s, Pickup and Keen practice transportable insulin pump device for CSII in type 1 diabetes mellitus individuals.[2][3] In the year 1976 the world saw the invention of first insulin pumps.[4] Recently insulin pumps manufactures shows more improvement. It became less in size and more practical for usage. The American Diabetes Association identify that CSII is as unhurt as multiple injection therapy, when suggested measures are monitored.[5] Insulin Pumps are undersized electronic devices which provide insulin by two approaches:[6]

- Basal Insulin, which is constant & continuous calculated dosage.
- Bolus Insulin, which is a mealtime dose.

Common indications and contraindications for insulin pump treatment in diabetic individuals:[7][8]

Indications	Contraindications
Repeated events of sever hypoglycaemia with multiple daily injections	Diabetes with psychiatric disorders
Patient failure to hits HbA1c goal inspite of MDI and HbA1c remains ≥ 8.5%.	Reluctance to self-monitor of blood sugar
Individual with diabetic complications such as neuropathy, nephropathy	shortage of time and motivation to maintain lycaemic control
Patient with considerable dawn phenomenon	Cannot be proficient on crucial practical part of insulin pump treatment
Diabetes individual looking for improved quality of life.	
Patients demanding extraordinary insulin dose.	
Pregnancy complicated with diabetes	

It is probable that approximately 375,000US patients use the insulin pump, with this figure likely to increase.[9] It has been used for more than 35 years.[10]

The FDA permitted Medtronic's MiniMed 530G with Enlite in 2013, under its novel Artificial Pancreas Device System-Threshold Suspend guidelines, as the earliest device that adjust insulin release in reaction to CGM sensor data.[11] Threshold suspend means that when CGM sensor glucose levels decline below a specified threshold, the pump warnings and hangs insulin delivery for 2 hours. The usage of this device has been revealed to lessen nocturnal hypoglycaemia.[12]

Exact Features of Patients Who Are Not Suitable Candidates for Insulin Pump Use:[13]

- Reluctant to implement MDI doses 3-4 daily, regular SMBG more than 4 daily and carbohydrate counting
- Absence of inspiration to accomplish close-fitting glucose control
- History of psychiatric disorders (e.g., psychosis, severe anxiety, or depression)
- Significant doubts about pump usage affecting lifestyle (e.g., contact sports or sexual activity)
- Impracticable hopes of pump therapy (e.g., faith that it reduces the need to be in charge for diabetes controlling)

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Indication of CSII for paediatric diabetic patients issued in 2006 in Berlin on conference attended by specialists in paediatrics diabetes:[14]

- Raised HbA1c levels on injection remedy
- Recurrent, severe hypoglycaemia
- Usually unsettled glucose levels
- A management schedule that compromises lifestyle
- Microvascular and macrovascular complications

Perfect nominees for paediatrics CSII include patients with interested relatives who are dedicated to observing blood glucose minimum 4 times per day and know show estimate bolus insulin doses.

a) Insulin Pump Treatment for diabetes during Pregnancy

Due to the fact that pregnancy is a state where hastened level of ketone bodies in the women.[15] Minimum hours of insulin intermission can cause hyperglycaemia and ketosis. High ketone bodies during pregnancy lead to fetal death.[16] There is no long acting insulin in the pump infusion, there for to be safe side a little dose of neutral protamine Hagedorn(NPH) or insulin detemir may be administered at night to guarantee that there will never be a deficiency of insulin in circulation if the needle get out.13

Advantages and Disadvantages of Insulin Pump Therapy: [17][18][19][20]

Advantages	Disadvantages
Improve glycaemic control which was proved by the Diabetes Control and Complications Trial (DCCT)	Numerous checking of blood sugars
Accurate insulin administration	Uncomfortable, during sports or sexual life
Lessening in dangerous hypoglycaemia and hypoglycaemic unawareness.	Connected to device 24 hours a day
Maintain blood sugar during pregnancy	Hazard of machine-driven insufficiency may lead to diabetic ketoacidosis
Better quality of life pliancy of lifestyle	Too expensive
Valuable l in Patients with Lipohypertrophy	*Shortage of expert team*
Decrease needle phobia	Infusion place reactions such as cannula site
Assisting treat the dawn phenomenon	Hazard of minor dermatologic changes and skin infection

Calculations for Insulin Pump Settings:[21]

There are two methods for calculating Pump total daily dose (TDD):

- Pre-pump TDD× 0.75
- Patient weight: kg × 0.5 orlb × 0.23

Pump dose modification:

- Basal Rate: (Pump total daily dose × 0.5)/24 h Carbohydrate Ratio: 450/total daily dose
- Insulin Sensitivity Factor: 1700/Pump total daily dose TDD

Causes of in explicable high blood sugar in patient using insulin Pump: [22]

1. Insulin Pump
   - Basal rate set imperfectly
   - Pump failure; syringe is not progressing
2. Syringe
   - Insulin outflow
   - Needle becomes displaced from instilling place
   - Air/blood is in the infusion set
   - Needle has been positioned in scar tissue; insulin cannot be supplied, and a high pressure alarm will sound
   - Twisted tubing precludes insulin transfer
   - Insulin obstruction due to use of non-buffered insulin in the infusion set
3. Infusion Site
   - Soreness, irritation, inflammation will modify insulin absorption
   - Primary systemic infection lead to insulin resistance
4. Insulin
   - Insulin has been unprotected to risky hotness and has been deactivated
   - Insulin has expired
   - In appropriate meal time bolus of insulin was used

II. Conclusion

In diabetic patient, the ideal way to administer insulin is in away mimic pancreas releases it. The perfect method to administer it in that way is insulin pump more than any other methods.[23] Nowadays the growing acceptance of insulin pump treatment has positioned more responsibility on medical experts and nonmedical personnel who do not have diabetes speciality, like accident and emergency department, hospital staff and school teachers. This revolution necessitates that these specialist strain themselves with this form of insulin supply.[24]

References Références Referencias

1. Alsaleh FM, Smith FJ, Keady S, Taylor KMG. Insulin pumps: from inception to the present and toward the future. J Clin Pharm Ther [Internet]. 2010 Apr [cited 2015 Jul 15]; 35(2): 127–38. Available from: http://www.ncbi.nlm.nih.gov/pubmed/20456732
2. Bode BW, Sabbah HT, Gross TM, Fredrickson LP, Davidson PC. Diabetes management in the new millennium using insulin pump therapy. Diabetes Metab Res Rev [Internet]. Jan [cited 2015 Jul15]; 18 Suppl1: S14–20. Available from: http:// www.ncbi.nlm.nih.gov/pubmed/11921425
3. Appendix 2: The History of Insulin Pumps «Diabetes Support Information Exchange [Internet]. [cited 2015 Jul 15]. Available from: http://www.diabetes-support.org.uk/info/?p=287
4. History of Diabetes: American Diabetes Association® [Internet]. [cited 2015 Jul 14]. Available from: http://www.diabetes.org/research-and-practice/student-resources/history-of-diabetes.html
5. History of Insulin Pump Therapy|Advanced Therapeutics [Internet].[cited2015Jul 14]. Available from:http://www.advancedtherapeuticsuk.com/history-insulin-pump-therapy
6. Insulin Pumps: American Diabetes Association® [Internet].[cited 2015 Jul 15]. Available from: http://www.diabetes.org/living-with-diabetes/treatment-and-care/medication/insulin/insulin-pumps.html
7. 04_use_of_insulin_pump.pdf[Internet].[cited2015Jul 15].Availablefrom:http://www.japi.org/july_2014_special_issue/04_use_of_insulin_pump.pdf
8. Management of type1 diabetes mellitus in children and adolescents [Internet]. [cited 2015 Jul 14]. Available from: http://www.uptodate.com.abc.cardiff.ac.uk/contents/management-of-type-1-diabetes-mellitus-in-children-and-adolescents?source=preview&search=first+Insulin+pump&language=en-US&anchor=H21&selectedTitle=2~150#H21
9. U.S. Food and Drug Administration. General Hospital and Personal Use Medical Devices Panel. Insulin infusion pumps panel information. Available at: http://www.fda.gov/downloads/AdvisoryCommittees/CommitteesMeetingMaterials/MedicalDevices/MedicalDevicesAdvisoryCommittee/GeneralHospitalandPersonalUseDevicesPanel/UCM203749.pdf.2010.
10. Bruttomesso D, Costa S, Baritussio A. Continuous subcutaneous insulin infusion (CSII) 30 years later: still the best option for insulin therapy. Diabetes Metab Res Rev.2009; 25:99-111.
11. U.S. Food and Drug Administration. MiniMed 530GFDA Approval Letter. Available at: http://www.accessdata.fda.gov/cdrh_docs/pdf12/p120010a.pdf2013.
12. Bergenstal RM, Klonoff DC, Garg SK, et al. Threshold-based insulin-pump interruption for reduction of hypoglycemia. NEnglJMed.2013; 369: 224-232.
13. Insulin-pump-management cs.pdf [Internet]. [cited2015Aug2]. Available from: https://www.aace.com/files/insulin-pump-management-cs.pdf
14. Phillip M, Battelino T, Rodriguez H, Danne T, Kaufman F. Use of insulin pump therapy in the pediatric age-group: consensus statement from the European Society for Paediatric Endocrinology, the Laws on Wilkins Pediatric Endocrine Society, and the International Society for Pediatric and Adolescent Diabetes, endors. Diabetes Care [Internet]. 2007Jun1[cited2015Aug5]; 30(6): 1653–62. Available from: http:// care.diabetesjournals.org/content/30/6/ 1653.long
15. Buchanan TA, Metzger BE, Freinke IN. Accelerated starvation in late pregnancy: a comparison between obese women with and without gestational diabetes mellitus. AmJObstetGynecol.1990; 162:1015-1020.
16. Jovanovic L, Druzin M, Peterson CM. Effect of euglycemia on the outcome of pregnancy in insulin-dependent diabetic women as compared with normal control subjects. Am J Med. 1981; 71: 921-927.
17. CSII: benefits and drawbacks-Management-Diapedia, The Living Textbook of Diabetes [Internet]. [cited 2015 Jul 15]. Available from: http://www.diapedia.org/management/csii-benefits-and-drawbacks
18. Management of type1 diabetes mellitus in children and adolescents [Internet]. [cited 2015 Jul 14]. Available from: http://www.uptodate.com.abc.cardiff.ac.uk/contents/management-of-type-1-diabetes-mellitus-in-children-and-adolescents?source=preview&search=first+Insulin+pump&language=en-US&anchor=H21&selectedTitle=2~150#H21
19. Continuous subcutaneous insulin infusion for the treatment of diabetes mellitus|Guidance and guidelines|NICE.NICE; [cited2015Jul28]; Available from: https://www.nice.org.uk/guidance/ta151
20. Model of care document.pdf[Internet].[cited 2015 Jul 28]. Available from: http://www.hse.ie/eng/about/

Who/clinical/natclinprog/paediatricsandneonatology programme/paeddiabetes/modelofcaredocument.pdf
21. Bode BW, Kyllo J, Kaufman FR. Pumping Protocol: A Guide to Insulin Pump Initiation. Medical Education Academia.2013. Medtronic.
22. A Primary Care Approach to Continuous Subcutaneous Insulin Infusion [Internet]. [cited 2015 Jul29]. Available from: http://journal.diabetes.org/clinical diabetes/V17N31999/Pg113.htm
23. Basics of Insulin Pump Therapy.pdf[Internet]. [cited2015Aug6]. Available from: https://www.medtronicdiabetes.com/sites/default/files/library/support/BasicsofInsulinPumpTherapy.pdf
24. Boyle ME, Seifert KM, Beer KA, et al. Guidelines for application of continuous subcutaneous insulin infusion(insulin pump) therapy in the perioperative period. JDiabetesSciTechnol.2012;6:184-190