USE OF INSULIN PUMP FOR THE 1ST TIME IN A GOVERNMENT HOSPITAL "JJ HOSPITAL, MUMBAI"



• Dr . Hemant Gupta [Associate Prof. & Unit Head, Dept of Medicine, J.J.Hospital, Mumbai]

- Dr . Ayaz Ahmed [lecturer]
- Dr. Parag Rahatekar [PRESENTOR & P.G resident]
- Dr. Balram Yadav [P.G resident]
- Dr .Samkit Mutha [P.G resident]



INTRODUCTION

- The increasing use of insulin pump therapy over the last 15 years, particularly in children, has been driven by :
- Improvements in pump technology
- Availability of insulin analogues
- Results of the Diabetes Control and Complications Trial (DCCT), which established the benefit of improved glycaemic control¹.

Despite this increased use, the outcomes of pump therapy continue to be debated.



CASE REPORT

- A 24 years old female, a second year management student was diagnosed to have
 Diabetes mellitus Type 1 in 2007, when she was just 18 years.
- She was started on daily insulin injections, which had to be injected subcutaneously two to three times a day.



- But real tragedy happened in her life in September 2013, when she got infected with **pulmonary koch's**.
- She became breathless and started vomiting and was taken to a pvt. hospital, where she became unconscious and put on **ventilator support**.
- She was in **coma for 5-6 days** and on ventilator support in the isolation ICU struggling for life.
- After 6 days she became conscious, but was not able to maintain her respiration and was kept on ventilator support for 15 days. She remained in **ICU for six weeks**.



- Her blood sugar level was fluctuating.
- These **episodes of hyperglycemia and hypoglycaemia** continued throughout her illness for many weeks.
- She was then referred to J.J.Hospital
- She was observed for her illness and tried to manage on subcutaneous insulin and after few days her blood sugars were controlled.



• Considering her last experiences and wide fluctuations in her sugar levels, decision was taken **to implant an insulin pump** to her.



INSULIN PUMP IN OUR PATIENT AT J.J.HOSPITAL

• The insulin pump is a device for continuous insulin delivery. After installing such a device patients sugars were well controlled and she is recovering fast in wards.

• After such a nightmare this device came as a good hope for a productive and healthy life.

• Her **overall hospitalisation** of around 3 months cost her **about 8-9 lakhs** .

• Cost of an insulin pump is about 2-2.5 lakhs in India.

• Her monthly follow up on insulin pump is showing great results with improvement in her A1c levels as well as general well being and has been cost-effective for the family.

WHETHER SHE SHOULD HAVE BEEN STARTED ON INSULIN PUMP AT EARLIER STAGE ???

DISCUSSION

- Type 1 diabetes is an autoimmune condition in which the body's immune system mistakenly destroys the insulinproducing cells in the pancreas.
- To replace that lost insulin, they must either take:
 Multiple daily injections of insulin or use an Insulin pump

WHY WE DO IT ? BETTER CONTROL REDUCES COMPLICATIONS

- 1. DCCT Research Group, Ophthalmology. 1995;102:647-661
- 2. DCCT Research Group, *Kidney Int.* 1995;47:1703-1720
- 3. DCCT Research Group. Ann Intern Med. 1995;122:561-568.

WHAT LOWERS THE A1C

- Frequent testing *
- Frequent boluses *
- Rapid insulin *
- Accurate carb counting *
- Easy bolus calculations *

- Basal can be adjusted to precise need *
- Bolus based on carbs and BG *
- Properly set doses *

* WHERE AN INSULIN PUMP HELPS

INSULIN PUMP

• More physiologic insulin delivery to mimic the pancreas like an "**ARTIFICIAL PANCREAS**"

•**Basal**: steady background insulin delivery to keep blood glucose from rising while fasting

• **Bolus**: spurts of insulin to cover meal time carbs or lower high BGs

INDICATIONS FOR INSULIN PUMP THERAPY

- INTERMITTENT INSULIN INJECTIONS ARE NOT MEETING TREATMENT GOALS AND OUTCOME MEASURES ARE SUBOPTIMAL, INCLUDING BUT NOT LIMITED TO:
- 1. Frequent and unpredictable fluctuations in blood glucose levels.
- 2. A1C >7.0-7.5%, accompanied by frequent severe hypoglycemia (<55mg/dl).
- Hypoglycemic events requiring third-party assistance or interfering with work, school, or family obligations.

2009 The American Association of Diabetes Educators.

INDICATIONS FOR INSULIN PUMP THERAPY

- RECURRENT HYPOGLYCEMIA, NOCTURNAL HYPOGLYCEMIA, ACTIVITY-INDUCED HYPOGLYCEMIA AND HYPOGLYCEMIC UNAWARENESS.
- PREGNANCY
- RECURRENT DIABETIC KETOACIDOSIS
- DAWN PHENOMENON
- GASTROPARESIS
- PATIENT PREFERENCE, MEAL-TIMING FLEXIBILITY AND NORMALIZTION OF LIFESTYLE

2009 The American Association of Diabetes Educators.

BASAL AND BOLUS IN PUMPS

INFUSION SETS

INFUSION SITES

ADVANTAGES OF PUMPS

- more **CONVENIENT** and discreet than injection
- better **QUALITY** of life
- delivers more **PRECISE** amounts of insulin than can be injected using a syringe.
- Thus **TIGHTER CONTROL** over blood sugar ,**A1c** levels & reducing the chance of **long-term complications** associated with diabetes.
- This is predicted to result in a LONG TERM COST SAVINGS relative to multiple daily injections

[•] Conget Donlo I, ET AL. (2006). "[Cost-utility analysis of insulin pumps compared to multiple daily doses of insulin in patients with type 1 diabetes ellitus in Spain]". *Rev. Esp. Salud Publica* (in Spanish; Castilian) **80** (6): 679–95

- High cost of the equipment and the consumables
- Unawareness of the new technology and its incredible benefits

 Meta-analysis of 12 controlled trials (600 people) found classic pumps lower A1c by 0.56%, lessen BG variability and require 7.58 fewer u/day

BRET MICHAELS -SINGER

BMJ. 2002 Mar 23;324(7339):7052

STUDIES ON INSULIN PUMPS vs MDI

• Another meta-analysis of 20 studies found a "modest but worthwhile improvement" of 0.61% in A1c with pumps using 11.9 fewer units a day

SIR STEVEN REDGRAVE. 5 TIME OLYMPIC GOLD

Health Technol Assess. 2004 Oct;8(43):1-186

• The cost incurred by insulin pump therapy is a major concern. However recent evidence indicates that CSII is a **cost effective treatment** compared to MDI in type1 diabetes. However such evidence in type 2 diabetes is lacking.

St Charles ME, Lynch P, Graham C, Minshall ME. A cost effectiveness analysis of continuous subcutaneous insulin injection vs multiple daily injections in type 1 diabetes patients: A third-party US payer perspective. Value Health. 2009; 12: 674-686

STUDIES CARRIED ON INDIAN POPULATION

In a study, a total of 46 subjects with T2DM and using multiple daily injections (MDI) were switched over to CSII for 6 months. The mean HbA1C value 6 months after initiation of CSII was 7.6 ± 1.2%, compared to 8.1± 1.4% at baseline while using MDI. The difference in the mean between the 2 groups (0.54%) was statistically significant and the subjects also expressed high overall satisfaction level in sexual function[83%] and peripheral neuropathic pain[87%] with CSII after 6 months.

Kesavadev J,et al. reduction of glycosylated hemoglobin following 6 months of continuous subcutaneous insulin infusion in Indian population with type 2 diabetes. Diab Technol Therpeu 2009;11:517-21.

STUDIES CARRIED ON INDIAN POPULATION

• In another study published by Sudhakaran C et al., insulin pump therapy was found to be effective in **lowering HbA1C in recalcitrant diabetes**. Apart from significant reduction in A1C, the reduction in the frequency of severe hypoglycemia and absence of diabetic ketoacidosis was noticed in this retrospective study that followed up T1 subjects (n = 17) and T2 subjects (n = 16) for a mean duration of 3.4 years.

 Kesavadev J, Kumar A, Ahammed S, Jothydev S. Experiences with insulin pump in 52 patients with type 2 diabetes in India. Abstract number: 2021 PO. 68th Scientific Sessions of American Diabetes Association, 2008.

STUDIES CARRIED ON INDIAN POPULATION

• In another study involving 52 type 2 diabetic subjects, 48 of them reported tremendous improvement in the **quality of life** after being deployed with the insulin pumps and 42 achieved A1C <6.5%.

• Kesavadev J, rasheed SA, Nair Dr. Achieving desirable glycemic targets without the risks of hypoglycemia using a teletitration programme. Abstract number: 0421 P. 67th Scientific Sessions of American Diabetes Association, 2007.

INSULIN PUMPS TODAY

• ACCU-CHEK SPIRIT – ROCHE

- AMIGO NIPRO CORPORATION
- DANA DIABECARE 11S SOAIL DEVELOPMEN
- MINIMED PARADIGM REVEL MEDTRONIC
- **OMNIPOD INSULET CORPORATION**

ONE TOUCH PING – ANIMAS CORPORATION

FAMOUS PERSONALITIES ON INSULIN PUMP

BRET MICHAELS -SINGER

JAY CUTLER

SIR STEVEN REDGRAVE. 5 TIME OLYMPIC GOLD

NICOLE JOHNSON-MISS AMERICA 1999

NICK JONAS - MUSICIAN

Convergence Toward Automation

• CLOSED LOOP SYSTEM MIMICK PANCREAS: insulin pump technology is combined with a continuous blood glucose monitoring system, the technology seems promising for real-time control of the blood sugar level.

• Insulin pumps are being used for infusing pramlintide (brand name Symlin, or synthetic amylin) with insulin for improved postprandial glycemic control compared to insulin alone.

USING INSULIN PUMP – LIKE IN DRIVER'S SEAT & NOT A HELPLESS PASSENGER

FUTURE OF INSULIN PUMPS

- Dual hormone insulin pumps that infuse either insulin or glucagon: particularly valuable in a closed loop system under the control of a glucose sensor.
- Ultrafast insulins: These insulins are absorbed more quickly than the currently available Humalog, Novolog, and Apidra which have a peak at about 60 minutes.

TAKE HOME MESSAGE

- Despite the initial inconvenience of learning a new technology, it is foreseen that pumps will become cheaper and more popular, offer better flexibility, and improve the quality of life for diabetic patients.
- Insulin pump is a useful and cost effective treatment in type 1 diabetes though larger trials needed before we can recommend insulin pumps for type 2 diabetes with confidence.
- Indian guidelines for use of CSII should be brought out by combined efforts of RSSDI and Endocrine Society of India.

PUMPS HAVE COME A LONG WAY

September 2003

THANK YOU.....