Infusing Subcutaneous Immunoglobulins: Comparison of the Constant Flow System (Electronic) and Constant Pressure System (Mechanical)

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Introduction

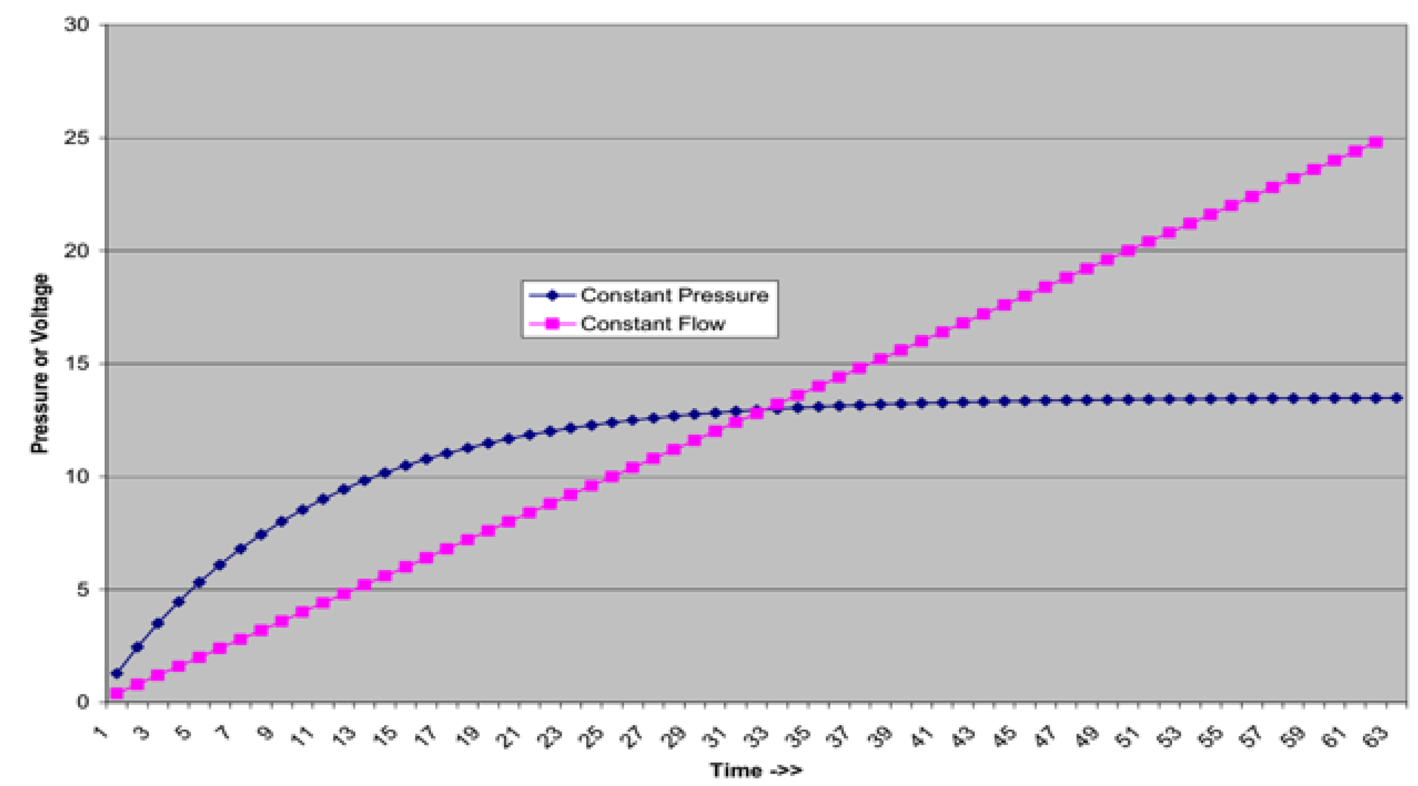
Successful SCIg infusions depend on patient selection and training, infusion experience, and treatment adherence. Factors like the flow rate, volume, needle length, and device pressure impact the infusion experience. Healthcare providers must monitor patients closely to ensure safe and effective drug delivery by adjusting these factors as needed.

Overview

The pressure profile of the infusion device is particularly important for new or inexperienced patients with limited subcutaneous space. Excessive pressure can affect site tolerability and medication absorption. This overview aims to compare constant flow (electronic) and constant pressure (mechanical) infusion systems for subcutaneous immunoglobulin delivery, highlighting their differences and implications for SCIg administration.

Results

During subcutaneous infusions, the expansion of subcutaneous tissue and mechanical strain increase backpressure, especially at higher flow rates. To address this, a maximum working pressure of less than 1 bar is recommended to reduce pressure-related issues. Constant flow systems use electronic pumps programmed to infuse at a set rate, but if backpressure exceeds the occlusion limit, the pump stops and requires manual intervention. In contrast, constant pressure systems, like the Freedom Infusion System, operate at low pressure and automatically adjust the flow rate to balance increasing resistance at the infusion site, resulting in fast and safe infusions with fewer complications and interruptions. The viscosity of immunoglobulins and factors like temperature and patient conditions can also affect the flow rate. Healthcare providers should consider the pressure profile and dynamic balance between the infusion system and the patient to select a subcutaneous administration system that minimizes discomfort and ensures safe drug delivery.



Ease of use is an important consideration for successful self-administration of SCIg. Constant flow systems require programming, managing alarms, and regular maintenance, while constant pressure systems offer simpler operation with no maintenance requirements. Patient education, support, and healthcare provider training are crucial for safe and effective SCIg delivery. A comparison table shows that constant flow systems have higher operating pressure and an occlusion alarm, while constant pressure systems have lower pressure to minimize infusion site reactions.

Administration components	Constant Flow System CFS	Constant Pressure System CPS
Ease of use	Programming and pump function controls. Needs batteries or electricity.	Flow rate tubing selection and 2 function controls. No batteries or electricity needed.
Maximum operating pressure	20–85 psi	15 psi
Operating mechanism and force	Flow rate is programmed by healthcare provider.	Maximum flow rate is defined by the flow rate tubing selected by healthcare provider.
Backpressure from the patient	Pump will generate higher pressure to overcome backpressure to keep the set flow rate.	The system has an operation limit of 0.93 bar. If backpressure occurs in the fluid path, the flow rate decreases.
High infusion pressure safety parameters	Occlusion alarm is set to activate when high infusion pressure is reached (2 to 6 bars). The higher the alarm set, the longer it will take for the infusion pressure to reach the limit and activate the alarm. High pressure may cause local site infusion site reactions.	The limitation to 0.93 bar or 15 psi is set on the necessity of a pump pressure safety limit. Based on literature, pressure limit under 15 psi reduces problems related to pressure build up (local infusion site reactions).

While no head-to-head safety comparisons between constant flow and constant pressure infusion systems have been published, two European trials utilizing the FREEDOM constant pressure system examined the safety profiles of subcutaneous immunoglobulin (SCIg) administration compared to intravenous immunoglobulin (IVIg) administration, yielding positive outcomes for the constant pressure system.

In the Markvardsen et al. study, SCIg significantly improved muscle strength and disability in patients with chronic inflammatory demyelinating polyradiculoneuropathy (CIDP), with a majority of patients expressing a preference for this method. The Hagan et al. study reported mild to moderate infusion site reactions. These findings indicate that the constant pressure system offers favorable outcomes for SCIg administration. Additionally, in a separate UK evaluation comparing the constant pressure Freedom60 system with the constant force Crono system, it was observed that the constant pressure system required fewer training sessions per patient.

Discussion

Successful SCIg administration relies on healthcare provider training, needle length selection, and diligent monitoring. Infusion systems for SCIg include electronic devices with constant flow and mechanical systems with constant pressure. While low-pressure systems offer balanced parameters, increased backpressure or resistance can cause discomfort. Electronic devices maintain flow rate but may raise pressure, leading to site reactions and disruptions. Constant pressure systems are user-friendly, adjust flow based on tissue saturation and resistance, enhancing infusion experience and adherence..

Conclusion

The choice between Constant Flow System (CFS) and Constant Pressure System (CPS) for SCIG administration depends on ease of use, maximum pressure, and safety factors, with CPS being preferable for some due to simplicity and lower pressure, while CFS offers precise control but is more complex. Individualized selection, monitoring, and further research are needed for safe and effective SCIG therapy.

References

Upon request due to size limitations.