

Multi-Patient Analysis of Steroid-Induced Hyperglycemia in Diabetic Patients Using Continuous Glucose Monitoring

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Background:

- **Steroid therapy can cause hidden spikes in blood sugar** — traditional monitoring often misses them.
- Continuous glucose monitoring (CGM) reveals **real-time patterns of steroid-induced hyperglycemia**, uncovering when and how glucose levels truly fluctuate.

Objective:

- To characterize the glycemic response after a single steroid injection using CGM data and assess differences by:
 - **steroid type**
 - **gender**
 - **age**

Methods:

- **Observational study** of 58 diabetic patients (mean age 64.6 years) receiving a **single steroid injection** for pain relief.
- Patients **grouped by steroid type** (dexamethasone, methylprednisolone, triamcinolone), **gender**, and **age** (<64.6 vs. ≥64.6 years).
- **Continuous glucose monitoring (CGM)** recorded glucose **every 5 minutes for up to 10 days** post-injection.

Results:

- **All steroid types caused a rapid glucose rise within 2 hours**, with **dexamethasone showing the highest and most consistent peak** (~220–225 mg/dL), followed by a decline to ~150 mg/dL at 24–36 hours.
- **Methylprednisolone** induced a **moderate, delayed increase**, while **triamcinolone** showed **variable, inconsistent glucose patterns** despite similar peak levels (~220 mg/dL).
- **Females showed higher peaks and faster recovery**, and **younger patients (<64.6 years) had more dynamic fluctuations**, whereas **older individuals** displayed **flatter, steadier glucose profiles**

Conclusion:

- This study provides the most detailed CGM-based insight into steroid-induced hyperglycemia in a real-world setting.
- **Distinct glycemic patterns** were identified — **dexamethasone** produced a **predictable, rapid glucose excursion**, while **methylprednisolone** caused a **delayed, gradual rise**.
- **Dexamethasone’s consistent profile** suggests potential for **anticipatory glycemic management** during steroid therapy.

Limitation:

- **Small triamcinolone sample size** limits the reliability and comparability of its glycemic response profile.
- **Reduced CGM data after day 8** introduces variability and **restricts interpretation of long-term glucose trends**.

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References:

- **Coutinho & Chapman, 2011** – Glucocorticoids: anti-inflammatory & immunosuppressive
- **Strehl et al., 2019** – Glucocorticoids: versatile immune modulators
- **Van der V., 1998** – Glucocorticoids: mechanisms & anti-inflammatory effects



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Table 1. Distribution of steroids, dosage, injection site, and gender						
Steroid Type	Participant s	Avg Age	Gender		Dosage Dist. (no. of patients)	Inj. Sites Dist. (no. of patients)
Dexamethason e	38	64.7	16	22	10 mg (38)	Cervical Epidural (7), Lumbar Epidural (31)
Methylpredniso lone	15	65.4	6	9	40 mg (12), 80 mg (3)	Lumbar RFA (6), Lumbar epidural (4), Sacroiliac joint injection – Bilateral (5)
Triamcinolone	5	61.5	2	3	40 mg (3), 40 mg x 2 (2)	Sacroiliac joint injection – Bilateral (5)

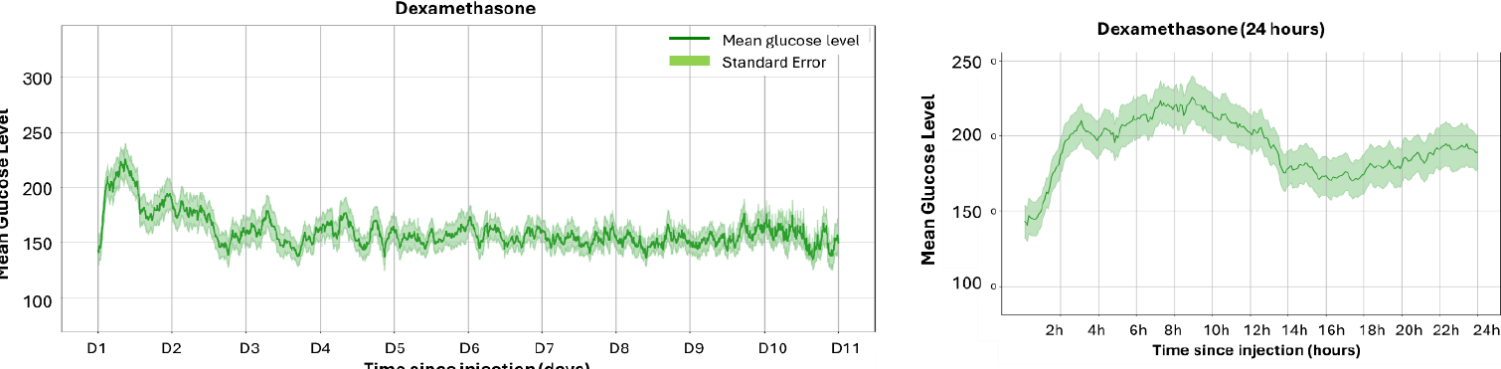


Figure 1. CGM profiles following dexamethasone injection. Plots show mean blood glucose levels (mg/dL) over time with bands representing standard error. (Left) Entire monitoring period (11 days) post-injection. (Right) Expanded view of the first 24 hours postinjection to highlight the glycemic excursion phase.

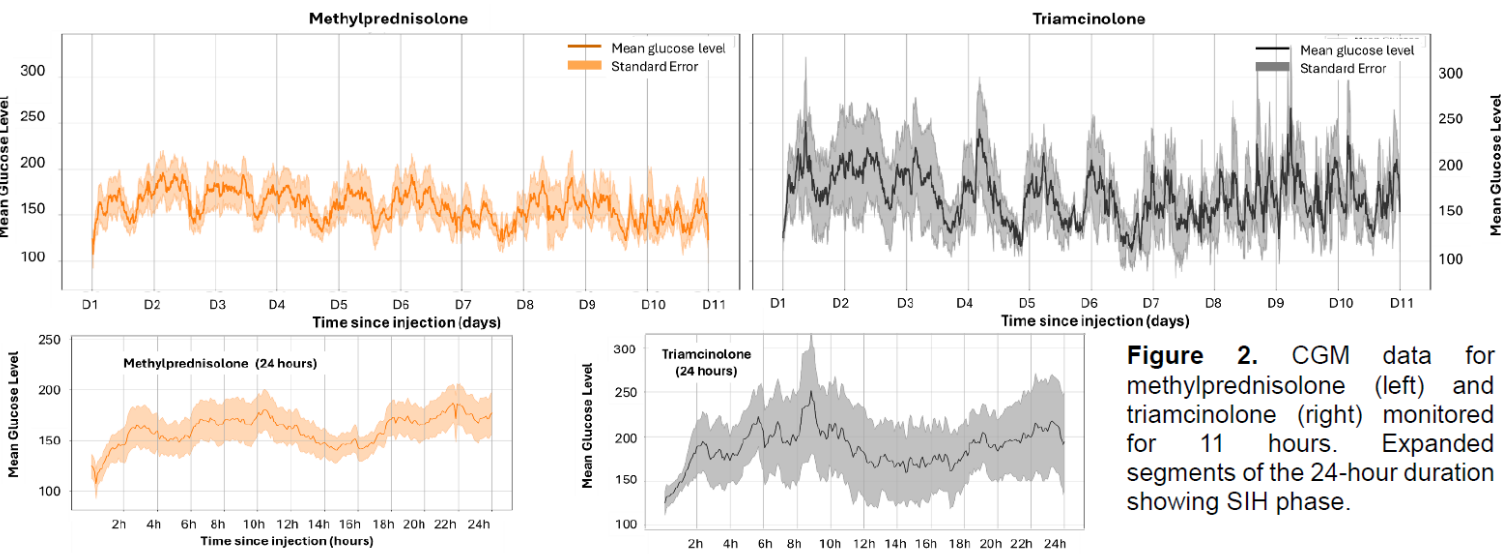


Figure 2. CGM data for methylprednisolone (left) and triamcinolone (right) monitored for 11 hours. Expanded segments of the 24-hour duration showing SIH phase.

Continuous glucose monitoring reveals steroid-specific glycemic patterns, enabling more precise and anticipatory management of steroid-induced hyperglycemia

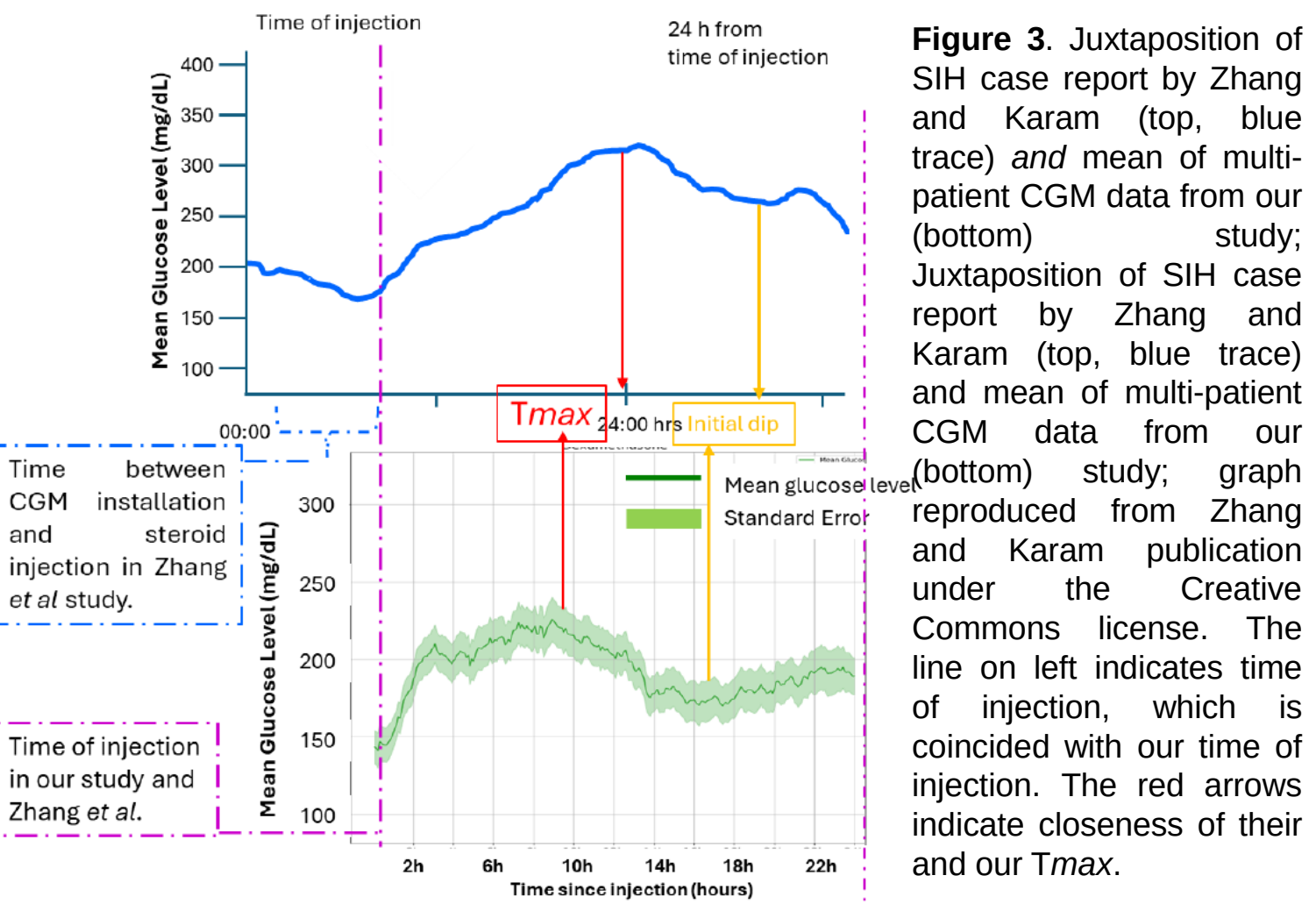


Figure 3. Juxtaposition of SIH case report by Zhang and Karam (top, blue trace) and mean of multi-patient CGM data from our study; Juxtaposition of SIH case report by Zhang and Karam (top, blue trace) and mean of multi-patient CGM data from our study; graph reproduced from Zhang and Karam publication under the Creative Commons license. The line on left indicates time of injection, which is coincided with our time of injection. The red arrows indicate closeness of their and our T_{max}.

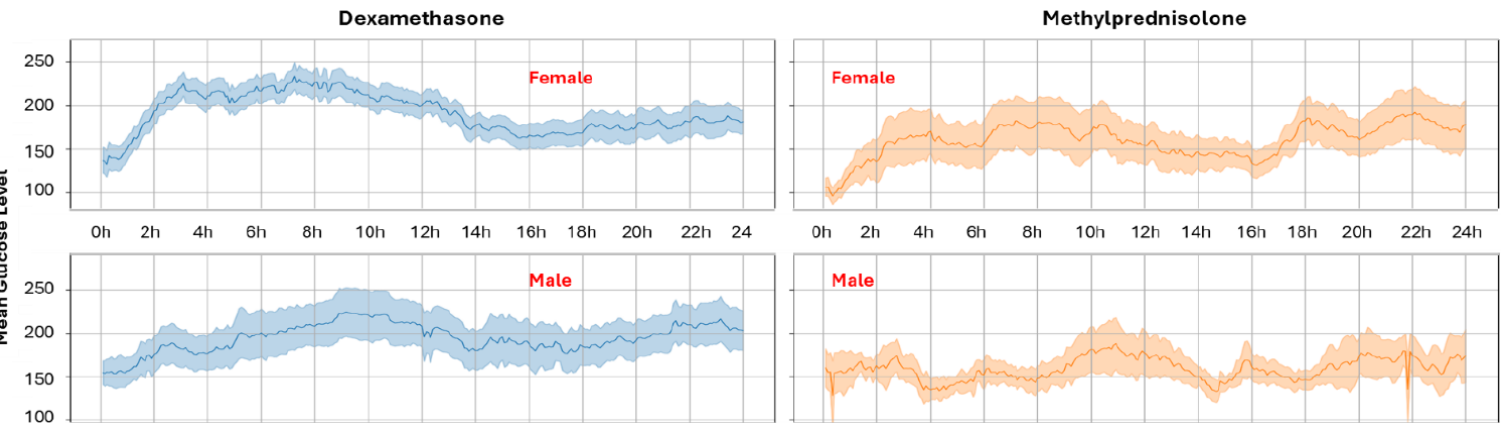


Figure 5. Plot of CGM data separated based on gender.

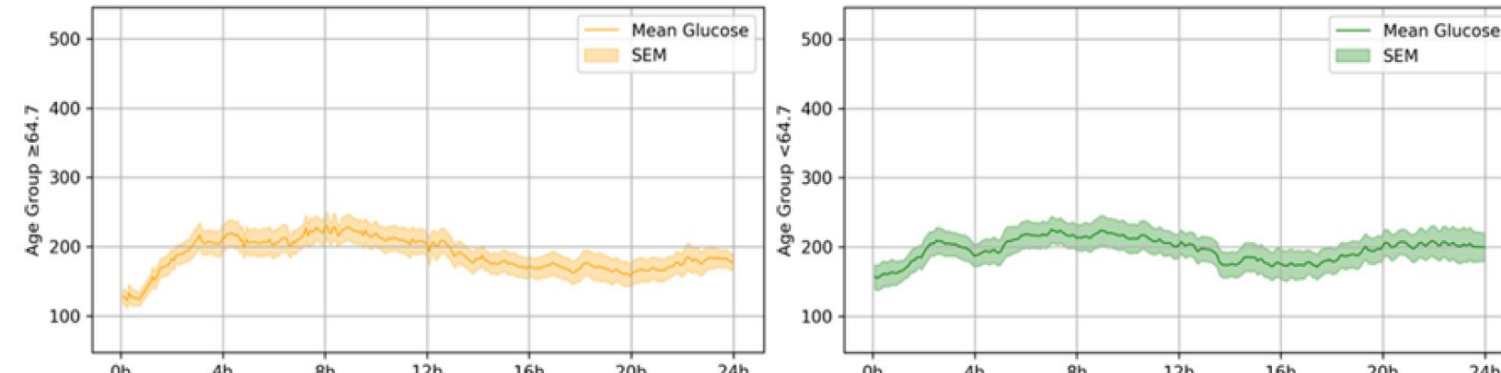


Figure 6. Glucose response over 24 hours following dexamethasone injection, shown by age group (<64.7 and ≥64.7). Table summarizing key features such as peak glucose, time to peak, Area Under the Curve, return to baseline, end-of-day glucose, and variability.

