Slow Release Iodine Dressings in Large Burns: Outcomes & Thyroid Function

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INTRODUCTION

Iodine containing dressings comprise various labeling contra-indications and/or precautions for patients with thyroid disfunction (e.g., Graves', Hashimoto's, Hypothyroid, Goiter, etc.). Further, precautions are also provided for treatment surface areas greater than labeled limits for a single application and cumulative weekly applications. However, immediate release/high dose iodine products (povidone/tincture) are the basis for most of these precautions. Limited data exists for modern slower releasing/lower dose iodophors now available.

High TBSA burns are known metabolic crises resulting in hypermetabolic states.[1,2] The acute thyroidal response is reported as a predictable drop in thyroid hormone marked by inconsistent TSH levels over time. Patient criticality, pharmacotherapy (corticosteroids / vasopressors / amiodarone), and thyroid function are all identified as potential sources of variability.[1,2,3]

PRIMARY GOALS

- Determine if a correlation exists with thyroid function testing and burn wound treatment with slow-release, lower dose wound dressings e.g. SR foam iodophors.
- Quantify the differences in absolute dose (exposure) among iodine containing dressings.
- Collect data to support internal use protocols for future patients.

METHODS

A retrospective case series was reviewed with large TBSA burn patients treated in our burn center with a new, lower dose, slow release iodophor foam dressing*. The patient histories were reviewed for clinical outcomes, potential confounding pharmacotherapy, and thyroid function in comparison with untreated cases of similar TBSA's documented in the literature.[3]

Iodine Exposure by Dressing Category

A determination of absolute iodine exposure potential by product class is provided below:

Iodine Dressing	Thickness Applied to Wounds	Amt Applied per cm^2 (mg)	Percent Iodine (w/w or w/v)	Iodine Dose per cm^2 (mg)	Iodine Dose 40% TBSA (g)	Vs. IoPlex Dose	Relative Release Rate
Cadexomer Iodine* SR semi-solid iodophor	1/4 inch *(max dose)*	718	0.9%	6.5	43.9	312% > SR Foam*	Slow
Cadexomer Iodine SR semi-solid iodophor	1/8 inch *(min dose)*	359	0.9%	3.2	22.0	106% > SR Foam*	Slow
1- Povidone Iodine PVP-I "Soaked" Gauze Pad	Saturated *(max dose)*	426	1.0% (free iodine)	4.1	27.6	159% > SR Foam*	Immediate
2- Povidone Iodine PVP-I "Wetted" Pad	68% Saturated *(median dose)*	291	1.0% (free iodine)	2.8	18.8	77% > SR Foam*	Immediate
3- Povidone Iodine PVP-I "Damp" Pad	Fully wrung out *(min dose)*	144	1.0% (free iodine)	1.4	9.3	-13% < SR Foam*	Immediate
I-Plex® Foam ® SR solid foam iodophor	2 (mm)	19.6	8.0%	1.6	10.7	0%	Slow

* *Dressing used in this study.* *IoPlex® +Iodosorb®

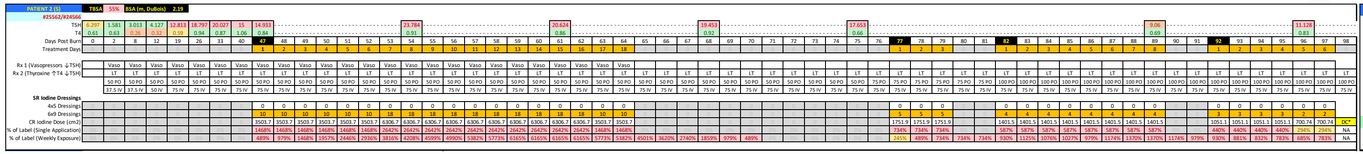
Quantification of Povidone Iodine Soaked Gauze

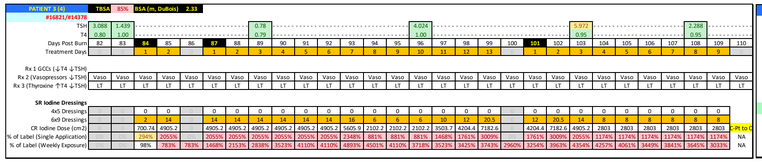
1-"Soaked". Fully saturated, but not dripping. Common to practice.

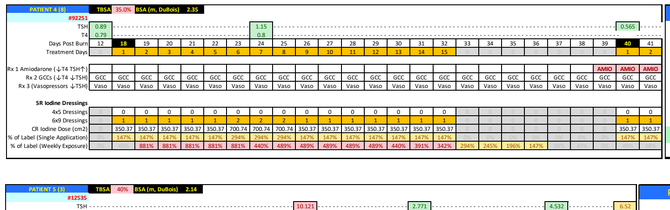
2-"Wetted". Partially wrung out. ~ 2/3 remains by weight (68%) after partial manual compression and expression of excess. Very common to practice.

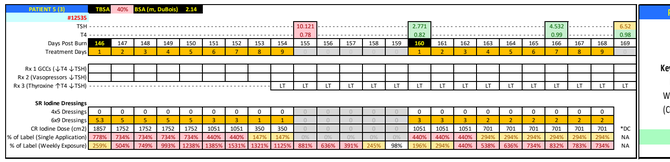
3-"Fully wrung out." About 1/3 remains (34%) after full manual compression and expression of all excess. Less common to practice.

Longitudinal Analysis of Key Patients (continued)





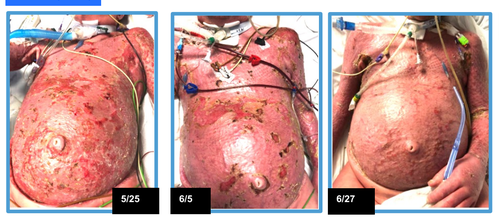


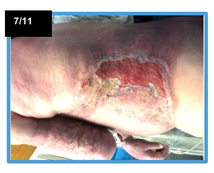


RESULTS – Clinical Outcomes

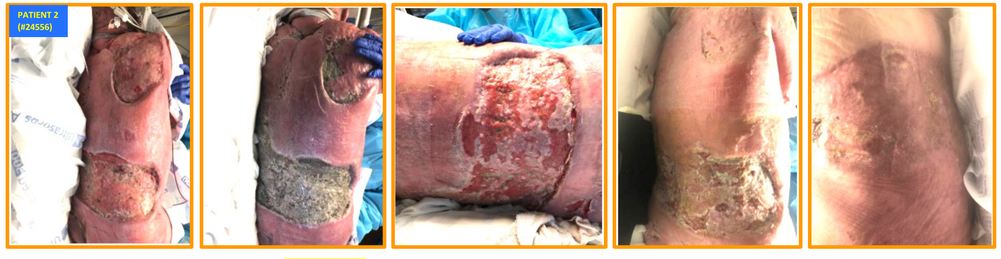
While the data herein focuses on the thyroid impact of topical iodine, all eight (8) patients benefited clinically. Severe burn infections are life threatening, hence our ultimate desire to study thyroid impact of this SR foam iodophor. The following cases are provided to illustrate the clinical merits in our burn center.

PATIENT 1 (#66785)





Significantly healed, infection controlled
DC SR iodophor foam



6/19
DC SR iodophor foam

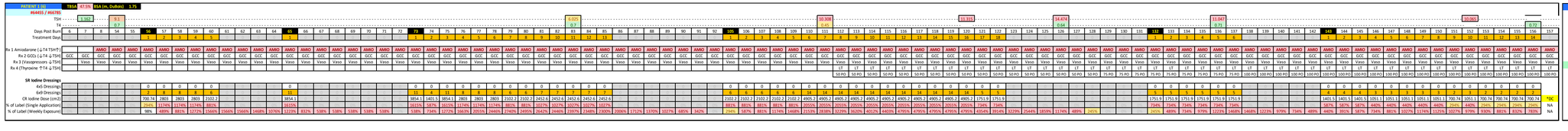
6/29 (10 days) rapid regression
Restart SR iodophor foam

7/9 (10 days)
Much improved

8/25 Continued Improvement

8/25 Significantly healed
DC SR iodophor foam

Longitudinal Analysis of Key Patients



RESULTS & SUMMARY DATA – Thyroid Impact

Even at the high TBSA treated (max 80%, average 48%), the individual longitudinal patient thyroid profiles ***do not support a significant correlation*** with thyroid function testing and iodine exposure from the slow-release foam iodophor dressing of study†. Further, the tabular summaries below are in alignment and ***do not demonstrate any apparent correlation***, at least with the low dose, slow-release foam iodophor under assessment in our burn center.

Three of the eight patient cohort, recorded TSH levels above normal; however, these elevated values were not correlative to iodine exposure or variable *during* exposure (i.e., up, then back down). Further, these TSH levels were not outside of published elevated TSH values for similar sized wounds ***untreated with iodine*** *(see Group I & II below).* In contrast, five of the eight patients treated showed no impact to TSH levels at all, prior to, during, or after treatment with the SR iodophor foam dressing.

Even at the high doses required for such large burns (averaging 7 fold greater than the daily, and 19 fold greater than the weekly labeled precautionary limits) including patients with documented Hashimoto's disease and hypothyroid, no patient demonstrated any clear correlations with topical SR iodine treatment and thyroid changes.

	Group I Ctrl 1 (no tx)	Group II Ctrl 2 (no tx)	Pooled (ctrl) Untreated	Group III Tx Group
n	10	10	20	8
Ave TBSA	56.0	57.2	56.6	47.8
Max TBSA	65	68	68	80
Ave TSH	6.5	7.3	6.9	5.9 ≠ NCS
% TSH > 5.5 (hi)	50%	50%	50%	50% ≠ NCS
% TSH > 2x normal	20%	40%	30%	38% / 25%* ≠ NCS

	Max TSH Untreated	Max TSH Treated
	20.0	23.7 ≠ NCS

Tx Group Patient	Ave Daily Dose*	Ave Weekly Dose*	Max Daily Dose*	Max Weekly Dose*
1	2.1	4.7	2.9	5.4
2	1.1	2.6	1.1	2.6
3	4.4	10.5	7.8	15.3
4	16.6	39	30.1	48.9
5	13.8	48.1	26.4	61.7
6	10.4	26.3	20.6	48
7	6.1	13.9	7.3	15.2
8	1.7	4.5	2.9	4.9
Average	7	18.7	12.4	25.2

* *less amiodarone patient*

≠ NCS = Not clinically significant.

* *multiple of label precaution (e.g. 2.1 means the dose was 2.1 fold > than precautionary limits)*

Note: The large TBSA of severe burns require significantly more dressings than the labeled precautionary limits. Therefore, severe burns are an extreme test of the potential validity of those limits which are based on PVP-I and iodine tincture (historical higher dose / immediate release products).

Discussion / Conclusions

In treatment group, using a lower dose, slow release foam iodophor dressing, no impact on the thyroid (i.e., thyroid function testing) could be linked to treatment, even at exceptionally high treated surface areas (i.e., doses). More specifically, when elevated TSH levels were present, the frequency of elevation was independent of iodine dressing treatment periods and not significantly different from untreated patients with similar burn TBSA's.[3] This is especially encouraging, and worthy of expanded study, as in our clinical judgement this SR foam iodophor intervention may have proved life saving for several of the critically ill patents within the cohort.

Independent of topical iodine, a clear link with severe burns (as a frank metabolic crisis) to thyroid hormone changes is supported by this study, in strong alignment with previous literature reports.[1,2] In fact, the data from this cohort of patients indicate that routine thyroid function testing (TFT) may be warranted, at least in severe burns, due to the apparent frequency of thyroid profile changes over the course of patient care. Last, routine TFT monitoring in severe burns may further be supported given that so many pharmaceuticals employed during burn care (e.g., steroids, vasopressors, amiodarone, etc.) are also known to impact the thyroid as we noted in patient 1 within the cohort. Interestingly, a true mapping of *longitudinal* thyroid response over the full course of healing appears lacking in the literature. For example, the median days post burn for TSH assessment was 2.8 weeks in the untreated controls vs. 9.7 weeks for the treatment group. Based on days post injury alone, TFT may cycle between normal and abnormal during care.

To gain a more comprehensive view of the dynamic thyroid impact for severe burns, future analysis might include more frequent TFT over the entire course of burn center stay and perhaps serum iodine levels (if treating with topical iodine).

REFERENCES

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* *IoPlex® Iodophor Foam Dressing*