Laboratory monitoring during isotretinoin therapy of acne: A systematic review and meta-analysis

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Introduction

- Recalcitrant or severe acne can be treated with isotretinoin, often with a dramatic improvement over a few months.
- Though extremely effective, isotretinoin has been associated with several adverse effects, including teratogenicity, hyperlipidemia[1] sometimes associated with pancreatitis[2], leukopenia[3], thrombocytopenia[4], or transaminitis[5] with hepatotoxicity[6].
- There are no evidence-based guidelines to direct the type and frequency of monitoring (excluding monitoring for pregnancy), and so it is not surprising that there is variability in the type and frequency of monitoring.

Purpose: To use extant data and meta-analytic methods to develop more robust estimates of the extent of laboratory changes that occur during the course of isotretinoin therapy for acne vulgaris.

Methods

Data Source: A systematic review and meta-analysis were performed. We conducted a comprehensive search strategy designed by a Master of Library and Information Science program–trained librarian to identify all relevant studies of oral isotretinoin use in adolescents and adults (9 to 35 years old) with acne vulgaris. Extensive and comprehensive searches were performed in MEDLINE, EMBASE, and the gray literature (via Google).

Inclusion Criteria: Inclusion criteria were developed *a priori* and included: studies of acne vulgaris, use of oral isotretinoin (altered sustained release or lipid-enhanced products were excluded), dose regimens of 40mg or more daily (or 0.5mg/mg or higher), duration of treatment for at least 4 weeks, and treatment of adolescents and adults (9-35 years old). Studies with a cohort or comparison design as well as case series of 10 or more were eligible. The study must have reported values for the laboratory tests of interest. (See Table) Screening was independently performed by 2 investigators (T.S., G.G.E.) and disagreements arbitrated by a third investigator (Y.H.L.). Data was abstracted by one investigator (T.S.) and checked for accuracy by a second investigator (Y.H.L.).

Exclusion Criteria: included any of the following criteria:

1. Altered sustained release or lipid-enhanced products.
2. Isotretinoin therapy for conditions other than acne.
3. Patients taking another medication for acne concomitantly.
4. Literature that was not a clinical study.

Statistical Analysis: Data was analyzed using Stata version 13 (StataCorp). An assessment of the quality of the evidence was not performed.

Results

A total of 106 articles were selected from 332 for full-text examination (Figure 1). 47 of these are randomized control trials and 14 are retrospective studies were included and contained a total of 19,489 participants. Mean measurements and differences between baseline and follow-up were calculated for various lipid and hepatic elements as well as a complete blood count (See Table 1).

- **Lipid Panel:** Most studies showed a moderate increase in serum lipids (decrease in HDL) in a minority of patients, typically occurring early in therapy and plateauing or decreasing in the following weeks. Values rarely exceeded moderate elevations.
- **Hepatic Panel:** Most studies reported no significant increase in the hepatic panel. Of the studies that did, increases were typically mild and transient. Moderate or severe elevations were seldom reported.
- **CBC:** CBC data was rarely reported, an analysis of WBC was performed but there was insufficient data for other CBC components and those studies that did showed no significant derangements from baseline.

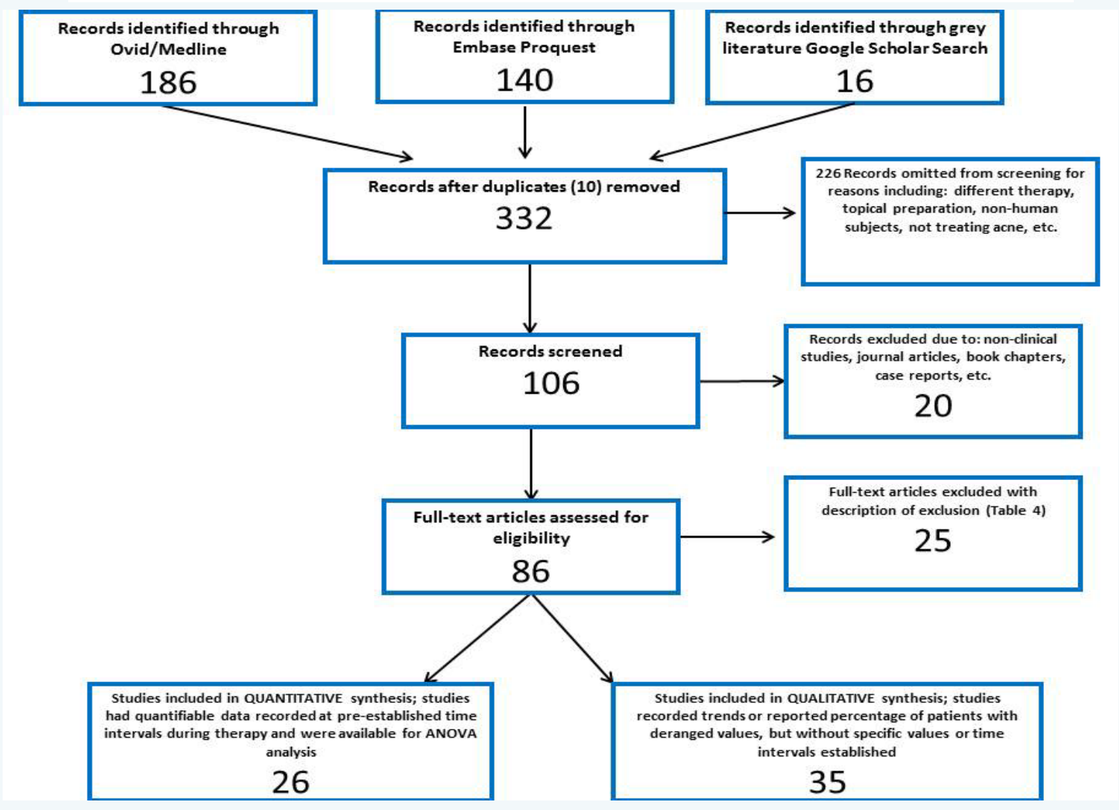
Table 1. Meta-analysis of Laboratory Monitoring performed during Isotretinoin Therapy for Acne vulgaris

Laboratory Test	Treatment Measurements Mean [99% CI] (non-baseline)	Difference: Baseline-Mean Follow-up Mean [99% CI]
Lipid Panel		
Triglycerides	119.98 mg/dL [98.58, 141.39]	36.96 mg/dL [22.12,51.79]
Total Cholesterol	184.74 mg/dL [178.17, 191.31]*	19.73 mg/dL [16.00, 23.47]
Low Density Lipoprotein (LDL)	109.23 mg/dL [103.68, 114.79]	16.08 mg/dL [13.37, 18.78]
High Density Lipoprotein (HDL)	42.80 mg/dL [39.84,45.76]	-4.82 mg/dL [-6.72 to -2.92]
Hepatic Panel		
	Treatment Measurements Mean [99% CI]	**Difference: Baseline-Mean Follow-up Mean [99% CI]**
AST/ SGOT	22.67 U/L [19.94, 25.41]	3.72 U/L [2.44-5.01]
ALT/ SGPT	21.77 U/L [18.96, 24.59]	3.22 U/L [0.99,5.45]
Alkaline Phosphatase	88.35 U/L [58.94, 117.76]	4.23 U/L [0.70,7.76]
Complete Blood Count		
	Treatment Measurements Mean [99% CI]	**Difference: Baseline-Mean Follow-up Mean [99% CI]**
White Blood Count	6.87 x 10^9/L [5.70, 8.03]	-1.13 x 10^9/L [-2.144, -0.11]

CI: Confidence Intervals

*One study had 99% CI extend above 250 mg/dL[7] **(**235.90 mg/dL [206.02,265.78])

Figure 1. Process of Citation Selection



Discussion

Strengths:

- This study highlighted the results of routine lab work as a result of isotretinoin therapy for acne treatment.
- For the vast majority of patients on isotretinoin for standard acne courses, it can be expected that patients will be able to complete their course without interruption based on changes in their lipid panel, hepatic panel, or leukocyte count.

Weaknesses:

- The compiled data lacked detailed information characterizing all aspects of the treatment, such as dosing changes, fasting status, and medical history, so correlations between isotretinoin doses and specific laboratory abnormalities could not be made.
- The study is also subject to reporting bias since we will only include studies that contain published laboratory data from patients on isotretinoin.

Conclusion: The evidence does not support monthly examinations for standard doses of isotretinoin for all acne patients. In our institution, we have altered our monitoring for the standard patient to include a baseline lipid panel and liver function tests, with follow-up testing at two months of treatment, with more frequent monitoring dictated by abnormalities detected. Further studies may be needed to indicate ideal intervals for testing to be both cost effective and clinically meaningful in order to prompt changes in therapy.

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