### Table 15h. Antiretroviral-Therapy-Associated Adverse Effects and Management Recommendations—Lipodystrophy, Lipohypertrophy, Lipoatrophy (Last updated May 22, 2018; last reviewed May 22, 2018) (page 1 of 2)

<table>
<thead>
<tr>
<th>Adverse Effects</th>
<th>Associated ARVs</th>
<th>Onset/Clinical Manifestations</th>
<th>Estimated Frequency</th>
<th>Risk Factors</th>
<th>Prevention/Monitoring</th>
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| Lipodystrophy (Fat Maldistribution) General Information | See below for specific associations. | Onset:  
• Trunk and limb fat initially increase; peripheral fat wasting may not appear for 12–24 months after ART initiation. | Varies greatly depending upon measure and comparator group. Frequency may be up to 15% with current regimens. | Genetic predisposition  
Puberty  
HIV-associated inflammation  
Older age  
Longer duration of ART  
Body habitus | See below. | See below.  
Physicians should perform a regimen review and consider changing the regimen when lipodystrophy occurs.  
Improvement following regimen change is variable. Improvement may occur after several months or years, or it may not occur at all. |
| Central Lipohypertrophy or Lipoaccumulation | Can occur in the absence of ART, but most often associated with PIs and EFV. | Presentation:  
• Central fat accumulation with increased abdominal girth, which may include dorsocervical fat pad (buffalo hump) and/or gynecomastia in males or breast hypertrophy in females, particularly with EFV. | Up to 15% with current regimens | Obesity before initiation of therapy  
Sedentary lifestyle | Prevention:  
• Calorically appropriate low-fat diet and exercise  
Monitoring:  
• BMI measurement  
• Body circumference and waist-hip ratio | Counsel patient on lifestyle modification and dietary interventions (e.g., maintaining a calorically appropriate healthy diet that is low in saturated fats and simple carbohydrates, and starting an exercise regimen, especially strength training).  
Recommend smoking cessation (if applicable) to decrease future CVD risk.  
Consider switching patient from PIs and EFV to an INSTI.  
Data are Insufficient to Allow the Panel to Safely Recommend Use of Any of the Following Modalities in Children:  
• Recombinant human growth hormone  
• Growth hormone-releasing hormone  
• Metformin  
• Thiazolidinediones  
• Recombinant human leptin  
• Anabolic steroids  
• Liposuction |
### Table 15h. Antiretroviral-Therapy-Associated Adverse Effects and Management Recommendations—Lipodystrophy, Lipohypertrophy, Lipoatrophy (Last updated May 22, 2018; last reviewed May 22, 2018) (page 2 of 2)

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<td>Facial/Peripheral Lipoatrophy</td>
<td>Most associated with thymidine analogue NRTIs (d4T &gt; ZDV)</td>
<td>Presentation: Thinning of subcutaneous fat in face, buttocks, and extremities, measured as a decrease in trunk/limb fat by DXA or triceps skinfold thickness. Preservation of lean body mass distinguishes lipoatrophy from HIV-associated wasting.</td>
<td>Up to 15% with currently used regimens</td>
<td>Underweight before ART</td>
<td>Prevention: Do not use ddi or d4T (individually or together); they are no longer recommended as part of an ARV regimen. Co-administration of ddi and d4T is contraindicated (no exceptions). Monitoring: Patient self-report and physical exam are the most sensitive methods of monitoring lipoatrophy.</td>
<td>Replace ZDV with other NRTIs if possible. d4T should never be used. Data are Insufficient to Allow the Panel to Safely Recommend Use of Any of the Following Modalities in Children: • Injections of poly-L-lactic acid • Recombinant human leptin • Autologous fat transplantation • Thiazolidinediones</td>
</tr>
</tbody>
</table>

**Key to Acronyms:** ART = antiretroviral therapy; ARV = antiretroviral; BMI = body mass index; CVD = cardiovascular disease; d4T = stavudine; DXA = dual energy x-ray absorptiometry; EFV = efavirenz; INSTI = integrase strand transfer inhibitor; NRTI = nucleoside reverse transcriptase inhibitor; PI = protease inhibitor; ZDV = zidovudine

### References

See the archived version of Supplement III, February 23, 2009 Guidelines for the Use of Antiretroviral Agents in Pediatric HIV Infection (https://www.aidsinfo.nih.gov) for a more complete discussion and reference list.

### General Reviews


**Associated ARVs/Etiology**


Management


32. Innes S, Harvey J, Collins I, Cotton M, Judd A. Lipoatrophy/lipohypertrophy outcomes after ART switch in children in UK/Ireland. 22nd Conference on Retroviruses and Opportunistic Infections; 2016; Boston, MA.


