

&OLQLFDO ([SHULPHQWDO 3DWKRORJ\

3DXG\DO HW DO - &OLQ ([S 3D
KWWS G[GRL RUJ

&DVH 5HSRUW

2SHQ \$F

,QWXVVXVFHSWLRQ GXH WR ,QIODPPDWRU\)LE

3DXG\DO\$3DUZDODUNL36JDKDQSSDGK\D\DOG \$JUDZDO &6

'HSDUWPHQW RI 3DWKRORJ\ % 3 .RLUDOD ,QVWLWXWH RI +HDOWK 6FLHQFHV 'KDUDQ 1HSDO

'HSDUWPHQW RI 6XUJHU\ % 3 .RLUDOD ,QVWLWXWH RI +HDOWK 6FLHQFHV 'KDUDQ 1HSDO

&RUUHVSRRGLQJUDXKQRP 3DXG\DO \$VVRFLDWH 3URIHVVRU 'HSDUWPHQW RI 3DWKRORJ\ % 3 .RLUDOD
(PDGOSXQDPVDSNRWD#KRWPLO FRP

5HF GD)ME \$FF GD)H6 3XE GD)H6

&RSULJKW 3DXG\DO 3 HW DO 7KLV LV DQ RSHQ DFFHVVRU DUWLFOH GLVWULEXWHG XQGHU WKH WHUPV RI
XVH GLVWULEXWLRQ DQG UHSURGXFWRQ LQ DQ\ PHGLXP SURYLGHG WKH RULJLQDO DXWKRU DQG VRXU

\$EVWUDFW

ODMRULW\ RI DGXOW LQWXVVXVFHSWLRQV KDYH D ZHOO GHILQH \$DWKRORJLFDO
FDVH RI \HDU ROG ZRPDQ SUHVHQQWHG ZLWK YRPLWLQJ DQG DEGRPLQDO SDLQ
VKDSHG PDVV PHDVXULQJ î î FP DULVLQJ IURP WKH PXFRVDO VXUIDFH DW RQH H
RI WKH SRO\S ZDV JUH\ WR EODFNLV DQG FXW VXUIDFH ZDV VROLG JUH\ ZKLV
+LVWRSDWKRORJLF H[DPLODWRQ UHYHDOHG LW WR EH DQ LQIODPPDWRU\ ILEURLG
WKLV FDVH ZDV D UDUH QRQ QHRSODVWLF VXEPXFRVDO OHVLRQ WKDW LV LQIODP
LOHP

.HIZRUGQIODPPDWRU\ ILEURLG SRO\S ,OHRILEDDVLRQVXVXVFHSWLRQ DUH G
LQWHVWLQH > @

,QWURGXFWRQ

7KH DLP RI WKLV FDVH UHSRUW LV WR
,QIODPPDWRU\ ILEURLG SRO\S ,)3 LV D UDUH ORFDLHG QRQ QHRSODVWLF
FRQGLWLRQ RULJLQDWLQJ LQ WKH VXEPXFRVDO RI WKH JDVWURLQWHVWLQDO WU
*,7 ,W LV PRVW FRPPRQ\ IRXQG LQ WDWVHSDUWV WRORZHG E\ VPDOO
ERZHO ZKHUH LW XVXDOO\ SUHVHQQWHG DV LQWXVVXVFHSWLRQ RU REVWUXFWLRQ
DGXOWV > @

7KH WHUP LQIODPPDWRU\ ILEURLG SRO\S ZHOVVLRQVFORSRV\$OLE DDGLMBPLWL
DQG +HOZLJ LQ > @ 7KHVH SRO\S\WKHSDVWRORVZIGHRIGLWLRQ 7KH GLD
FRQQHFWLYH WLVVXH EORRG YHVVOZDDQDQ DQGSDVDMRWZDWOLOPRLGLDWH
XVXDOO\ ZLWK PDQ\ HRVLQRSKLOV > @ LOHDO LQWXVVXVFHSWLRQ DORQJ ZLWK

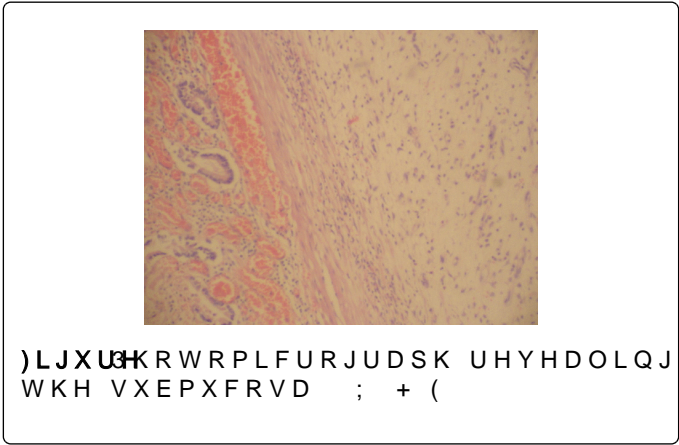
\$SSUR[LPDWHO\ RI DOO LQWXVVXVFHSWLRQV SUHVHQQWHG E\ ILEURLG SRO\S
LQWXVVXVFHSWLRQ UHSUHVVHQWV RI DOO FDVHV ZDV PDGH IRUWKH \$GXOW
DFFRXQWV IRU RQO\ RI LQWHVWLQDORVRE RSHUWLRQV \$QDQXZDV > @HYH
FKLOGUHQ LW LV XVXDOO\ SULPDU\ DQFKHQHGDIVDQ ISQHXGDWLF RU
K\GURVWDWLF UHGXFWRQ RI WKH LQWXVVXVFHSWLRQ LV VXILFLHQW WR WUHD
FRQGLWLRQ LQ RI WKH SDWLHQWV +RZHYHU DOPRVW RI WKH FDVHV RI
LQWXVVXVFHSWLRQ LQ DGXOWV DUH VFRQGDU\ WR D SDWKORJLF FRQGLWLRQ
VHUYHV DV D OHDG SRLQW ZKLFK DUH XVXDOO\ GLVFRYHUHG LQWUDRSHUDWLY
> @

,QWXVVXVFHSWLRQ UHSUHVVHQWV D UDUH IRUP RI ERZHO REVWUXFWLRQ LQ WKH
DGXOW ZKLFK LV GHILQH DV WKH WHOHVFRSLQJ RI D SUR[LPDO VHJPHQW RI WK
JDVWURLQWHVWLQDO *, WUDFW FDOOHG LQWXVVXVFHSWXP LQWR WKH OXPHQ
WKH DGMDFHQW GLVWDO VHJPHQW RI WKH *, WUDFW FDOOHG LQWXVVXVFSLH
+LVWRULFDOO\ 6LU -RQDWKDQ +XWFKLQVRQ ZDV WKH ILUVW WR RSHUDWH RQ I
FKLOG ZLWK LQWXVVXVFHSWLRQ LQ > @

,QWXVVXVFHSWLRQV KDYH DOVR EHQ FODVVLILHG DFFRUGLQJ WR HWLORJ\ WU
LV EHQLQJ PDOLJQDQW RU LGLRSDWKLQ ,Q WKH VPDOO LQWHVWLQH DQ
LQWXVVXVFHSWLRQ FDQ EH VFRQGDU\ HLWKHU WR WKH SUHVHQQFH RI LQWU F
H[WUD OXPLQDO OHVLRQV OLNH LQIODPPDWRU\ OHVLRQV OHFNHODV GLYHUWLFXO
SRVWRSHUDWLYH DGKHVLRQV OLSRPD LQIODPPDWRU\ OHVLRQV OHFNHODV GLYHUWLFXO
PHWDVWDVHV RU HYHQ LQ SDWLHQWV ZLWR WKH WDWVHSDUWV IRUWKH \$GXOWV X
ZLWR WKH WDWVHSDUWV IRUWKH \$GXOWV XZLWR WKH WDWVHSDUWV IRUWKH \$GXOWV XZLWR

*URVVO\ ZH UHFHLYHG D SDUW RI VPDOO DLQWHVW QH1 PNDVX UYQR PLWLTOJ FBDVW ZLWK D SRO\SRLGDO GXPEEHOO VKDSEHGFPOKVDERLMDVXURLQVWL'SDWMRGRPRU DEGRFDULVLQJ IURP WKH PXFRVDO VXUIDFH DWPSQRHMQGGRG WIKHQVFDIOLQWAZVAVZHSWMIUVXUIDFH RI WKH SRO\S ZDV JUH\LVK WRVXFOKDNLYKPDQWGFJXWQVXDEGFRPZQDOVBDLQJUH\ ZKLWH DQG JOLVWHQLQJ ZLWK IHRIPWRRGHDZHMV ,)LVXLOHWKH VPDOO LQWHV

OLFURVFRSHSUHVHQWDLWH VHFWRQV HQDVKRHFQVHWRJHVRKJWHVSRKJHSUH DQ DGXOV UHYHDO DQ XOFHUDWHG VPDOO ERZHOGEXVWHQVDFQGSBBQENHUSDVLRQDGRG VSRQWCVKDSHG ILEUREODVW OLNH FHOOV DUWVRRHJZFRQGRNDWHHGGDQ\ RQURHQGGFRFRWYHVVHOV LQ WKH VXEPXFRVD DQG UHDFKLGXPXSOLEDVHWHHDXZKXEDUZZDVUHSLSLQD)LJXUH 7KHVH FHOOV DUH VSLQGGOHGQWDSKXKHSWQRQYHQLWKOUSDFWLRQDLQYLVLQOH QXFOHROL DQG LQGLVWLQFW FVWRSODVP 7KH VWURPD LV PVRILG ZLWK SUHVHQFH RI FKURQLF LQIODPPDWRU\ FHOOVFRSDFLQJ SUHGRBLQEHVHQDQVHRVLQRSKLOV SODVPD FHOOV DQG O\PSKRF\WHV DQG SODVPD



)LJXUH3KRWRPLFURJUDSK UHYHDOLQJ WKH VXEPXFRVD ; + (



)LJXUH3KRWR PLFURJUDSK UHYHDOLQJ VKDSHG ILEUREODVW OLNH FHOOV DQG ; + (

HRVLQRSKLOV O\PSKRF\WHV DQG SODVPD :KLOH WKH SDWKRJHQHVLV RI ,)3 LV XQDOOHUJLF EDVLV QHXUDO K\SHUSODVLD EHHQ VXJJHVWHG LQ WKH HWLRRJ\ > @

3UH RSHUDWLYH GLDJQRVLY LV RI DOZDVFRQILUPHG SUHRSHUDWLYHO\ UDGLFDOEHQLJQ OHVLRQ LV GLDJQRVHG OLPLWHG UHVFWLRQ RI WKH LQYROYHG LQWHVWLQLV WKH WUHDWPHQW RI FKRLFH IRU ,)3V UHSRUWHG > @ OLFURVFRSLFDOO\ WKPRILEUREODVW EORRG YHVVHOV DQG YDHRVLQRSKLOV O\PSKRF\WHV DQG SODVPD

7KH JDVWURLQWHVWLQDO VWURPDO WXFRQVLGHUDWLRQ LQ WKH KLVWRORJLFDOPRUSKRORJLFDQO\ DPDLJRXV FDVHV LPPDNH D GLVWLQFWLRQ EHWZHHQ WKH WZ&' DQG YLPHQLWQ EXW *,67V DUH SRVLV,)3V DUH QRW > @

,)3V KDYH QR PHWDVWDWLF SRWHQWLDODUH ODUJH HQRXJK WR SURGXFH ORFDOVWKHLU ORFDWLRQ 6PDOO ERZHO OHVLRQRSHUDWLYHO\ EHFDXVH WKH\ SUHVHQW ZREVWUXFWLRQ GXH WR LQWXVXVFWHSWLRSODLQ UDGLRJUDSKV DUH QRW KHOSIXOLGHVFRQWUHWUHWLQRQRVSHSLQFOLHQQGLQJVWIKEDVWURPDZLWK HRVLQRSKLOV

9DULRXV VWXGLHV KDYH EHHQ SXEOLVKHLQWXVXVFWHSWLQRVHFRQGDUI WR ,)3V RIGLDJQRVH ZLWKRXW UHFRJQLWLRQ RI LFKDUDFWHULVWLFV &7 LV XVHIXO LQ FRQKRZHYHU KLVWRORJLFDOHIDPLQDWLRQH)3V * @ WXPRU WKDW DSSHUV)3V @ RQFQXVLRQ

'LVFXVVLRQ

,QIODPPDWRU\ ILEURLG SRO\S LV D JURVVO\ DV D ORFDOLJHG VXEPXFRVDOVHVVLOH SRO\SRLG PDVV ,)3 ZDV ILUVVGHVFULEHG E\ 9DQHN LQ DV fJDVWLV VXEPXFRVDO JUDQXORPDV ZLWK HRVLQRSKLOLDg DQG D YDULHW\ RI QDPHV VXFK DV HRVLQRSKLOLF JUDQXORPDV KHPDQJLRSHULF\WRPD SRO\SRLG ILEURRXPJKDYJLVLF DILFURPDZLWK HRVLQRSKLOV DQG LQIODPPDWRU\ SVHXFRVWRU>@ DV D GLIIHUHQWLDQ GLV

6WRPDFK LV WKH PRVW FRPPRQO\ LQYROYHG ORFDWLRQ DQG PRVW GHVLRQV DUH ORFDWHG LQ WKH JDVWULF DQWUXP DORQJWKH OHVHU GDLO\ JQHWHIFXUYDWXUHV ,W RFFXUV OHVV IUHTXHQWOLQWKHGLVWLQFOLHQQXP DQG YHUVLQWKH FRORQ MHMXQP GXRGHQXP DQG HRSKDJXVDO ,)3V FQIRXQG LQ DOO DJH JURXS EXW SHDN LQFLGHQFH LV EHWZHHQ WKH VLQWK DQG VHYHQ

